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ANATOMICAL EXERCITATIONS,

Concerning the
GENERATION
Of Living Creatures :

To which are added Particular Discourses,
of *Births*, and of *Conceptions*, &c.

By *WILLIAM HARVEY*, Doctor
of *Physick*, and Professor of *Anatomy*,
and *Chirurgery*, in the COLLEGE
of Physicians of *LONDON*.

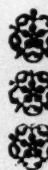


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TO THE
Venerable, & highly Accomplish't,
THE
PRESIDENT & FELLOWS
of the COLLEGE of Physicians
in LONDON,

GEORGE ENT

Wisheth Health and full Felicity.

❀❀❀ Bout Christmas last, while,
❀❀ A full weary of anxious, and
❀❀❀ in the end not much avai-
ling Solicitude, I endeavoured to
render my mind serene, and free from
that Eclipse; I addressed my self to
that Eminent Person, the chiefest
Glory and Ornament of our Colledge,
Doct^r Harvey, at that time resi-
ding not far from the City: and
found Him very intent upon the per-
scrutation of Natures Works, and with
a Countenance as cheerful, as Mind
imperturbed, Democritus like, deep-

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ly searching into the Causes of natural things. I then instantly saluted Him, with, Are all Affaires well, and right ?

How can they, He gravely answered, when the Common-wealth is surrounded with intestine troubles ; and I myself as yet far from land, tost in that tempestuous Ocean ? And ; unfeignedly (added He) if the comfort of my Studies, and the remembrance of many things, long since fallen under my observation, were not some refreshment to my Mind ; I know not what could prevaile upon me, to desire to survive the present. So it hath happened, that this umbratile kind of life, and vacation from publique Cares, which commonly causeth a Sadness of Mind in others, hath proved a Sovereign Remedy to mine.

Here I answering, said, Sir, I shall soon afford you the Reason of that happy Event ; which is this : While
the

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the greatest number of men flatter themselves with thoughts of growing wise, by the notions of others Brains, and (without any addition, unless the deceitful Gloss of different Phrase, and new Method) with ostentation obtrude upon the World the Traditions of the Ancients; it hath been always your choice, about the secrets of Nature, to consult Nature Her selfe. And this kind of Study ever hath as less of Fallacy, so more of Delight: in regard, that frequently, while you are fixt upon the indagation of some one thing, many others offer themselves to your obseruation; and such, perhaps, of which you had no thought to enquire. For, your self (I well remember) was pleased once to tell me, that you never yet Dissected any Animal (and, indeed, you have dissected very many) but you found in it somewhat beyond your expectation, and which you never so much as thought of before. A 3 'Tis

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'Tis true, replied He ; it hath ever been the delight of my Genius, to make strict Inspection into Animals themselves : And I have constantly been of opinion, that from thence we might acquire not only the knowledge of those less considerable Secrets of Nature ; but even a certain Adumbration of that Supreme Essence, the Creator. And, though I was ever ready to acknowledge ; that many things have been discovered by Learned Men of former times : Yet do I still believe, that the number of those things which remain yet concealed in the darkness of Impervestigable Nature, is incomparably greater : nay, I cannot forbear frequently to wonder, and sometimes smile at those, who perswade themselves, that all things were so consummatly and absolutely delivered by Aristotle, Galen, or some other great Name, as that nothing was left to the superaddition of
any,

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any, that succeeded. Nature, truly, is Her self the most faithful Interpreter of Her own secrets: and what she exhibits, either more briefly, or more obscurely, in one kind, the same she explains more largely and openly, in another. No man doubtless, hath ever rightly determined of the Use, or Office of any Part; who hath not in many Animals, beheld, and with himself diligently considered the Fabrick, Situation, annexed Vessels, and other Accidents thereof. Those Ancient Oracles of Wisdom did terminate the knowledge, as of all Countries, so also of all Animals, Plants, and other things whatever, almost with the narrow limits of Greece alone: But, to Us the whole Theatre of the World is now open, and, by the Sedulity of Travellers, we well know, not only the Place, Habits, and Manners of its Inhabitants; but also, what

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what Animals, what Vegetables, what Minerals every Region is furnished withal. Nor is there any Nation so Barbarous, which hath not either by chance; or the constraint of some inevitable necessity, found out something for the common use and benefit of Mankind, which hath escaped the invention of other Nations more Civilized. And shal we think that nothing of Commodity can accrue to the stock of Sciences, from these Helps and Advantages: but that all the Fountains of Wisdom were drawn dry by the First Ages? Certainly, this Fault is to be imputed to our own defect of Industry; not at all to Nature.

To this, another Evil hath adjoined it self; which is, that many, wanting the Experimental cognition of things, from the formerly conceived verisimilitude of some Opinion, afterwards boldly broach a positive judgement.

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judgment thereupon, as if it were certainly known: whereupon it follows, that they are not only grossly deluded themselves, but seduce others also (who are not sufficiently circumspect) into Error.

These, and other Discourses of the like importance; flowing from the Doctor, with admirable readiness, as is customary with Him; I interrupted Him, saying: Sir, How free you are from all culpability in this kind, all, who know you, sufficiently understand: and that's the reason; why many Learned and Judicious Men, who are acquainted with your Unwearied Industry, in the advancement of Philosophy, greedily expect the Communication of your further Experiments.

And would you then advise me, (smilingly replies the Doctor) to quit the tranquillity of this Haven, wherein I now calmly spend my days: and
again

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again commit my self to the unfaithful Ocean ? You are not ignorant, how great troubles my Lucubrations, formerly published, have raised. Better it is, certainly, at some times, to endeavour to grow wise at home in private ; then by the hasty divulgation of such things, to the knowledge whereof you have attained with vast labour, to stir up Tempests, that may deprive you of your Leasure and Quiet for the future.

Tea but (answered I) to deserve well, and receive ill, is the usuall reward of Virtue : And the Winds, which raised those your troubles, have, like the Wind Cæcias, drawn mischief upon themselves. With that, He shewed me His Exercitations, touching the Generation of Animals, A work framed, and polished with very great pains. At sight whereof, I instantly rejoicing, said, I now have obtained what I earnestly

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earnestly desired : and must tell you, that, unless you impart these Exercitations to the World, you will both be wanting to your own Honour, and en-
vy the Utility of others. Nor shall you sustain any further trouble in the Business ; for, whatever of Care is requisite to the oversight of the Press, I shall willingly take wholly upon my self. To this He condescended with much adoe, at first urging , among many other Disswasive Arguments, that this His Tractate would be imperfect, without the conjunction of the History of the Generation of Insects. In a word ; at length I prevailed : and He said, Loe, I resign these my Writings freely into your hands , with absolute power, either suddainly to publish, or for a while to suppress them, as you shall think convenient. Having returned Him very many thanks for so high a favour ; I took my leave, and departed
ted

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ted as another Jason, enriched with the Golden Fleece. And when, upon my return home, I had surveyed the Book; I could not but admire that so vast a Treasure had lain so long concealed: And that, while other men arrogate so highly to themselves, onely for the entertainment of their nauseating Readers, with Trifles and Toies, and Dishes twice (yea, an hundred times) brought to the Table before; the Modesty of this Gentleman should be such, as to set so small a value upon these His Excellent Observations. And truly, when ever He hath been pleased to give any of his own Inventions leave to see the light, He hath not deputed Himself with Ostentation, or superciliousness, after the custome of many, as if an Oak had spoken, or he had deserved a draught of Mens-Milk: but, His Dictates were Oraculous, and Merits above the reach of

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of Elogie, or Reward: but, with exceeding Modesty, as if onely casually, or without any difficultie of inquest, he had fallen upon the Discovery of those Mysteries, which, indeed, he long searched into with profest diligence, and study indefatigable.

And this also is an Argument of eminent Candour in Him; that he never invades the reputation of any Author, but every where delivers his own judgement, in mild and friendly language. For, with him it is Proverbial, that That Cause is worthy to be suspected for scarcely good and profitable, which its Author contends for with brawling and fierceness: But Truth can want no Patron.

And when it was easie to him, to have woven this whole Web, from materials of his own; such was his care, for the prevention of Envy, that he yet chose to follow the clue of Aristotle and Aquapendens, as if he
had

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had contributed thereunto no more
then meerly the Woofe. Of Him I
shall speak no more, lest I appear to
praise to his face a Person, whose
Worth hath advanced Him infinitely
above my praises; especially to You,
to whom his Virtue, Candor, and In-
genie, are long since very well known.
But, of My selfe, I shall ~~add~~ ^{say} only
thus much; that in this great Busi-
ness I have performed no more then the
meer office of a Midwife: producing
into the light this noble Issue of His
Brain, in all its parts and lineaments
perfect and consummate, as it is now
presented to your View; but staying
long in the Birth, & fearing, perhaps,
some injurious Blast of Envy or De-
traction. To speak more plainly, I made
it my Province to oversee and correct
the Press; and because the Author
writes so obscure a Hand (A thing,
as we say, common to learned men (as
that scarce any man, but who hath bin
accustomed

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accustomed thereto, can read it without difficulty, I used all diligence to provide against the Errors of the Compositor, that might be occasioned thereby; which I observed, not to have been duly prevented in the Impression of a small Treatise of the Doctors, not long since set forth.

And thus, most Learned Sirs, have I rendered you the Reason of this my Writing to you; which is, to let you know, that our HARVEY hath Sacrificed to the Benefit of the Commonwealth of Learning, to the Dignity of our Colledge, and to His own Eternal Honour.

Farewel, and Prosper.



To the Incomparable Dr. HARVEY,
On his Books

Of the *MOTION* of the *HEART* and *BLOOD*,
And of the

GENERATION of *ANIMALS*.

TO *Sol*, the grateful *Persian* homage payes;
He *Sees* by them, and so *Adores* the rays:

Deeming the *Suns* just title to arise

To th' *Tribute*, as to th' *Vision* of his *Eyes*,

And such is thy due claime, Great *Light* of *Art*,

Who to the long-dim *World* dost light impart.

To thy *Loud Fame* for ever be apply'd,

As th' *Conduct*, so the *Glory* of our *Guide*.

While gray *Antiquity* *Oracular* heares,

Not for the *Truths* she brings, but for the *Yeares*,

And her sower *Dictats* from the *Tripod* thrown,

Look more to be *Obe'y'd*, then to be *Known*.

Thy

Thy daring Art first stands her, and doth breed

This Rescue thence, that *Science* is not *Creed*.

Who for their *Age* alone doe *Writers* trust,

Prize *Armour*, not for th' *Proof*, but for the *Rust*.

From *Books* to *Nature* thy *Appeale* is made,

Thy *Copies* by their *Archetype* are swayd.

Though *High* and *Reverend* thy *Authors* sit,

Yet the *Creation* is thy *Classick Writ*.

The various *Colonies*, whose brood supplies

Inhabitants to *Earth*, to *Seas*, and *Skies*,

These are thy *Vatican*, and onely these

Are thy *Infallible Hippocrates*;

Thy *Sibyll-Volumes*, and Thou knowst them all,

Like their first *Godfather* before the *Fall*.

Their *Natures*, *Kinds*, *Distinctions* and *Concent*,

The *Parts containe'd*, and *Parts content*,

Their *Order*, *Substance*, *Temper*, *Site*, their *Force*,

Relations, and confederate *Entercourse*.

Their different *Cells*, which different *Bowels* bound,
Roof't and partition'd from their *Neighbours* ground.

The Numerous *Intrals* Thou hast searched
through,
Might both *Appease* the *Gods*, and *Surfet* too.

Not in the dull *Emerit Carcase*, where
The *Shops* remain where once the *Workmen* were ;
And onely yield this cold *Account* ; there stands
The *Stuffe* and *Tools* perhaps, but not the *Hands*.
But in the *Living Laboratories*, when
The *Vitals* ply'd their task like *Lab'ring men* ;
When *Life* and *Industry* one *Fountaine* fed,
And to give over *Work*, was, to be *Dead*.

And now the *Beasts* hold their *Instructive* life
Innobled by the *cunning* of thy *Knife*.
Their *Fall* heares *Sacrifice* to th' *Publick* good,
Nor is it to be *Slaine*, but *Vnderstood*.

There thy *Observing Eye* first found the *Art*
Of all the *Wheels* and *Clock-work* of the *Heart* :

The

The *mystic*k causes of its *Dark Estate*,
What *Pallies Close* its *Cells*, and what *Dilate*.
What secret *Engines* tune the *Pulse*, whose din
By *Chimes without*, *Strikes* how things fare *within*.

There didst thou trace the *Blood*, and first behold
What *Dreames* mistaken *Sages* coin'd of old.
For till thy *Pegasus* the *fountain-brake*,
The *crimson Blood*, was but a *crimson Lake*.
Which first from Thee did *Tyde* and *Motion* gaine,
And *Veins* became its *Channel*, not its *Chaine*.
With *Drake* and *Candish* hence thy *Bays* is curld,
Fam'd *Circulator* of the *Lesser World*.

Yet thou no sooner wroughtst this wonder out,
Though proof both gainst the cool suspense of
Doubt,
And rougher *Violence* o'th' *Despisers* tongue,
But *Europe* round with hot *combustions* rung :
Its early first *Defiance* sprung up here,
At last a swarm of *Champion Pens* appear

From *Forreign coasts*, and to the *conflict* come,
Some thy bold *Challengers*, thy *Seconds* some.
But when *Experience* vanquisht their *defence*,
And *Prejudice* was captive led by *Sense* :
The *Ingenious* laid down Arms, and fled to You,
As their *Instructor*, and their *Victor* too.
Thus *twice* endear'd, thy *Secrets* we allow,
By *Truths* at first, and by *Opposers* now.
So *Gold* disputed, and *Approved* such,
Comes *Mettle*, but parts *Treasure* from the *Touch*.

A Calmer welcome *this choice Peice* befall,
Which from *fresh Extract* hath deduced all,
And for belief, bids it no longer begg
That *Caster* once and *Pollux* were an *Egge* :
That both the *Hen* and *Houswife* are so matcht,
That her Son *Born*, is only her Son *Hatcht* ;
That when her *Teeming* hopes have prosp'rous bin,
Yet to *Conceive*, is but to *Lay within*.

Experiment, and *Truth* both take thy part :

If thou canst scape the *Women* ! there's the *Art*.

Live *Modern Wonder*, and be read alone,

Thy *Brain* hath *Issue*, though thy *Lips* have none.

Let frail *Succession* be the *Vulgar* care ;

Great *Generation's* selfe is now thy *Heire*.

M. LL. M. D.



THE PREFACE.

¶ Since many have requested, and
¶ S some have importuned mee; it
¶ will not, I hope, be unwelcome,
¶ (candid Reader) if what I have
observed concerning the *Generation of Animals*, out of Anatomical dissections (for I have found the whole matter to be much different, from that which is delivered, either by Philosophers or Physicians) I expose in these Exercitations, in favour, and for the use of the Lovers of Truth.

All Physicians, following *Galen*, teach, that out of the Seed of *Male* and *Female* mingled in *Coition*, according to the predominant power of *this*, or *that*, the Child resembles either *this*, or *that Parent*, and is also either *Male* or *Female*. And sometimes they pronounce the *Males Seed* to be the *Efficient* cause, and the *Females* the *Materiall*; and sometimes again the clean contrary.

But

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But *Aristotle* (*Natures* most diligent searcher) affirms that the *Male* and *Female* are the *principles* of *Generation*, and that *she* contributes the *matter*, and *he* the *form*; and that forthwith after Coition, there is formed in the Womb out of the Menstruous blood, the Vital principle, and first particle of the future *Fœtus*, (namely, the Heart, in Creatures that have blood.)

But that these are false, and rash assertions, will soon appear; and will like clouds instantly vanish, (when the light of Anatomical dissection breaks forth) nor will they require any elaborate confutation, when the Reader, instructed by his own eyes, shall discover the contrary by ocular inspection; and shall also understand, how unsafe, and degenerate a thing it is, to be tutored by other mens commentaries, without making tryal of the things themselves: especially, since *Natures Book* is so open, and legible.

I have therefore exhibited to publick view, what in these my *Exercitations*, I intend to deliver concerning the *Generation of Animals*; not onely that posterity may thence discern the certain and apparent truth; but also, and that cheisly too, that (by revealing the Method I use in searching into things) I might propose to
studious

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studious men, a new, and (if I mistake not) a surer path to the attainment of knowledge.

For although it be a more new and difficult way, to find out the nature of things, by the things themselves; then by reading of Books, to take our knowledge upon trust from the opinions of Philosophers: yet must it needs be confessed, that the former is much more open, and lesse fraudulent, especially in the Secrets relating to *Natural Philosophy*.

Nor is there any reason, why any man should be deterred by the trouble of it; if he will but so much as consider with himselfe, that even life it selfe is continued to him, by the never Wearied Agitation of the Heart. Nor truly would this journey present so much of solitude and desart to us; did not most men by the custome (or fault rather) of the age wee live in, yeilding themselves up to sluggishnesse, desire rather to erre with the many, then with the expence of their paines and coine, endeavour to be wise with the few: when notwithstanding the *Ancient Philosophers* (whose industry also even we extol) went a quite contrary way to work; and by indefatigable toile searching after several experiments, have set
up

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up a clear light to direct our studies. So that, whatever notable and approved thing we have in Philosophy, it all is derived unto us by the paines and industry of ancient *Greece*. Yet when we content our selves with their discoveries, and calmly believe (which is meer sleepiness) that there is now no more place for new inventions, the spritely edge of our owne wit languisheth, and we extinguish the lamp which they lighted to our hands. And certainly he alone wil grant, that the whole truth was ingrossed by the Ancients, (who is ignorant of the many noble discoveries, to pass by other *Arts*) lately found out in the business of *Anatomy*. And this was cheifly done either by such, who wholly intent upon some one thing, did casually descry some other: or (which is more commendable) by those, who following Natures conduct with their own eyes, have at length through a perplexed, but yet a most faithful tract, attained to the highest pitch of Truth. And in such an undertaking it is pleasant, not to be tyred onely, but even to faint away; where the Irkesomness of Discovering is abundantly recompensed by the discovery it selfe. We use, being covetous of Novelty, to wander far into unknown lands, that our
own

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own eies may witness, what our ears have received at second hand : where yet for the most part

—— *minuit præsentia famam.*

Our sight decries report.

Let us then blush, in this so ample, and so wonderful field of nature, (where performance still exceeds what is promised) to credit other mens traditions only, and thence coine uncertain problemes, to spin out thorney and captious questions. Nature her selfe must be our adviser ; the path she chalks must be our walk : for so while we confer with our own eies, and take our rise from meaner things to higher, we shall be at length received into her Closet-secrets.

Of the Manner and Order of attaining knowledge.

THough there be one onely roade to Science, namely, that by which we proceed from things *more known*, to things *known less* ; and from that which is *more manifest*, to that which is *more obscure* ; and though *Universals* are chiefly known to us (for Science is begot by reasoning from

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from *Universals* to *Particulars*) yet that very comprehension of *Universals* in the *Understanding*, springs from the perception of *Singulars* in our *sense*. So that both *A-L. 1. c. 2. 3.* *Aristotles* assertions are true, as well that in his *Physicks*; There is a way naturally layed from those things which are more known and cleare to us, to those things which are more intelligible and cleare by nature. For the same things are not both known to us, and simply so too: wherefore we of necessity must thus proceed; to wit, from those things which are by nature indeed more obscure, but yet are more clearer to us; to those things which are more cleare and intelligible by nature. But those things are first perspicuous and manifest to us, which are most confused. Therefore wee must goe from *Universals* to *Singulars*: for the *Whole* is more known by *sense*: now an *Universal* is a certain *Whole*. As that in his *Analyticks*. *Singulars* are more known by *Post. 2.* us, and doe first exist according to *sense*: for nothing is in the *understanding*, which was not before in the *sense*. And although that *Ratiocination* is naturally first and more known, which is made by *Syllogisme*; yet that is more conspicuous to us, which is made by *Induction*: and therefore we define *Singulars* with more ease, then *Universals*: for there lyes more *Equivocation* in *Universals*. Wherefore

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fore wee must pass from Singulars to Generals.

That which we have now delivered, hangs very well together, though at first it seem to clash : because *Generals* are first collected from *Singulars* by *sense*, and so farre onely are *more known to us*, as an *Universal* is a certain whole and indistinct thing ; and that *Whole* is *more known to us* according to *sense*. For though in all knowledge, we begin from *sense*, because, (as the Philosopher said before) *Sensible* particulars are *most known to Sense* ; yet *Sensation* it selfe is an *Universal* thing. For (if you minde it well) though (while we perceive) that which is in the outward organ of sense be a *Singular*, as suppose, a yellow colour, in the sight : yet that which is thence *abstracted* by the *internall sense*, and is judged and apprehended by it, is an *Universal*. Hence it comes to pass, that several persons, do at the same instant, abstract *divers species*, and fashion *severall notions*, even of *one and the same Object*. As it is evident in *Poets*, and *Painters* : who, though at the *same time*, and in the *same place*, all circumstances being alike, they behold *one and the same Object*, yet each of them, be they never so many, expresse and describe it a *several way*, according

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Ge- cording to the several *Ideas* which they
ed, have drawn in their *Phanſie*. So that a
iſt Painter being to draw any one mans pi-
iſt cture, though he take a thouſand ſeveral
ſo draughts, will make them all *diſtinct faces*;
V. and them too not onely differing
nd from each other, but from the Archetype
us it ſelfe: yet with ſo ſmall diſtinction, that
all if you look upon each of them apart,
ſe, you will think hee ſtill brings the ſame
ble piece hee brought before: and yet ſet
yet them all together and compare them, and
or you will plainly diſcover a difference.
we Now the reaſon of all this is, that in *Vi-
rd ſion*, or the *act of Seeing*, each particular
a by it ſelfe was *clear* and *diſtinct*: which
at very particular, the Object being remo-
all ved, (as ſuppoſe you ſhould ſhut your
by eies,) abſtracted in the *Phanſie*, or laid up
to in the *Memory*, is preſented *obſcure*, and
ne *confuſed*: nor is it any longer apprehend-
on ed as a *particular*, but as ſome *General* and
me *Univerſal thing*.

This ſubtilty *Seneca* doth elegantly ex- *Epist. 52.*
prefs, according to *Plato's* opinion. *An*
Idea, ſaith he, is an eternal Exemplar of
Natural things. I will explain this defini-
on, that you may conceive it the better. Sup-
poſe I intend to draw your picture, you your
ſelf are the Exemplar of that picture, from
whom

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whom my minde takes a representation, which she indeavourerh to pattern in her work. So then your face, which is my director, & which I labour to represent, is the Idea. And a little after, he saith. In my discourse even now I made use of a picture-drawer, to illustrate what I was speaking of. He, when he would paint Virgil, his eye is upon Virgil himself: Virgils face is his Idea, and the Exemplar of his future designe: now that which the Artist takes from this Idea, and worketh off, is the Picture. If you demand the difference between these two, it is this: the one is the Pattern, the other is the copy taken by the Pattern, and layed upon the work: He imitates the one, and makes the other. A Statue hath a face, but that face is but the Idos, or representation: But the Exemplar which the Statuary copies out, hath a face, and that face is the Idea. Doe you desire a farther explication? take it thus. The Idos is that which you see in the piece: the Idea is quite without the piece, and not onely without it, but also had a being before the piece was at all. For those things that have been formerly observed, and either by use, or custome have taken deep root in the minde of the Artificer, doe constitute art it selfe, and the Operative Habit: for Art it self is nothing but the reason of the work,

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work, implanted in the Artists minde. And the same way by which we gain an Art, by the very same we attain any kinde of science or knowledge whatever: for as Art is a habit whose object is something to be done; so Science is a habit, whose object is something to be known: and as the former proceedeth from the imitation of Exemplars; so this latter, from the knowledge of things naturall. The Source of both is from sense and experience; since it is impossible that Art should rightly be purchased by the one, or Science by the other, without a direction from Ideas. Yet in both Art & Science too, that thing which in sensible objects wee perceive, differs from the perception it self, which is kept in the memory, or imagination. That, is the exemplar, the Idea, the forme informing: this, the Representation, the Idos, the abstracted Species. That, is a natural thing, a real entity; this, a resemblance, or similitude, and an *ens rationis*. That, is imployed about some particular thing, and is it selfe a singular, and an individual; this, is a kinde of universal and common thing. That, is in every Artist and Philosopher, a sensible thing, clear, and perfect; this belongs to the mind, and is obscure. For what wee discover by sense, is much more sure
¶ and

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and *manifest*, then what we discover by the *Intellect*: because the latter springs from the former, and is illustrated by it. To conclude, *Sensible* Objects are of themselves, and before *Intelligible*; but *Intelligible* are after them, and arise from them: nor can we attain to them at all, without *their* help.

Wherefore it is, that our *judgement* erreth about phantasmes and apparitions comprised in our minds, unless *sense* give a right verdict, established upon frequent observations, and infallible experiments. For in every *Science*, be it what it will, a diligent observation is requisite, and *Sense* it self must be frequently consulted. We must not. (I say) rely upon other mens experience, but on our owne; without which, no man is a proper disciple of any part of natural knowledge; nor a competent judge of what I shall deliver concerning *Generation*; for without experimentall skill in Anatomy, he will not better apprehend it, then a man *born blind* can judge of the nature and difference of *colours*; or one *born deaf*, of *Sounds*. Therefore (discreet Reader) trust nothing I say, about the *Generation of Animals*; I appeale to none but thine eyes. For since every perfect *Science* builds upon those

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Principles, which it finds out by *Sense*: we must have a special care, that by customary dissections, we be sure those *Principles* are safely grounded. If we do otherwise, we may get a tumid and floating opinion: but never a solid and infallible *knowledge*:

As it happeneth to those, who see forraign countries only in *Maps*, and the bowels of men falsly described in *Anatomical tables*. And hence it comes about, that in this rank age, we have many *Sophisters*, and *Book-wrights*; but few *wise men*, and *Philosophers*.

And thus much I thought fit to premise as a *Tast*, that you may understand, by what helps I my self was assisted, and upon what consideration I was induced to communicate these my *Observations*, and *Experiments*: and that you treading the same path, may be able not onely to be an equitable *Umpire* between *Aristotle*, & *Galen*, but also forsaking al subtleties; and probable conjectures, and viewing Nature in her own glasse, may search out many other things yet unrevealed, and perhaps more precious.

Of the former matters, according to *Aristotle*.

NO kind of knowledge is innate to us, according to *Aristotle*: For neither
¶ 2 *Opinion*

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Opinion, nor Art, nor Understanding, nor Speech, nor Reason it self, are in us by nature, and from our birth; but all these are of the lineage of those things, which happen to us *from without, according to nature*. As also all those qualities and habits, which are esteemed to be spontaneous, & placed within our own power; such are *Virtues and Vices*, for which we receive neither commendation, and reward, or disgrace, & punishment. The knowledge therefore of any thing whatsoever must be our proper purchase. But which are the first principles of this knowledge, is not the scope of this discourse.

Yet I suppose it will not be amiss, to premise here, Whence, and How we come to know, that we may attain to a more perfect understanding of the *Generation of Animals*, and also take away any scruple which any man might raise about *Aristotle's* opinion. For he affirms, *all doctrine, and Dianoetical discipline to be framed out of precedent knowledge*: Whence it seems to issue, that there is either no first knowledge, or else that that first knowledge is born with us; which is dissonant to what is said before.

Analyt.
post. l. 1.
c. 1.

ib. l. 2.
cap. ult.

This doubt is hereafter cleared by *Aristotle* himself; where he teacheth that

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manner how knowledge is acquired. For having taught, that all certain knowledge is gained by Syllogism, and Demonstration; and that all demonstrative Syllogismes, are built upon some first, true, and necessary principles; he at last inquires, how principles become known, and what is that notifying habit; as also, whether habits are begotten, since they were not in us before; or else, whether they lurked conceal'd, in case they were in us? We have not, saith he, those habits; for it happens that they are hid from those who acquire more exquisite knowledge by demonstration. But if we receive them, when we had them not before, how should we make it known, and how should we learn out of a non-preceding knowledge? It is plaine therefore that we have them not, and that they are not in us, and we not know of them; and that they cannot be begotten in men that have yet no habit at all. Wherefore it necessarily follows, that we have some power to attain them, and yet not such a one as is more excellent, and exquisite then they. Now this seems to be a common thing to all creatures living: to have a connate power of Judging, which is called Sense.

Now since they have Sense, some of them retain in them the things they perceive by sense, and some not. They who retain not,

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have either no knowledge at all, or else no knowledge of what they do not retain, beyond the bare sensation it self. Others do retain in their Soul something of what they perceive. And since there are many such, they are thus differenced; that in some there doth result a certain discourse from the memory of things retained, and in some not. By Sense therefore memory is made, as we say; and out of a frequent remembrance of the same thing, is experience made: (for many numerical Remembrances, are one Experience) but out of Experience, or an Universal resting in the soul (namely out of one, which is distinct from the many particulars, and is one and the same in all of them) is raised a Principle of Art, and Science: of Art, if it relate to Generation; (that is, to doing, or effecting;) of Science, if it appertain to that which is, (that is, to the knowledge of an Entity simply;) so that the habits we speak of, are neither naturally in us, neither are they made out of other habits more known, but they proceed from Sense.

By which words of Aristotle, it evidently appears, by what Order the knowledge of any Art, or Science is attained: Namely, by Sense there remains an impression of the thing perceived: by that impression is made a remembrance of it, and from multiplied memory, proceeds Experience: from

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Experience, Universal Reason, Definitions, Maxims, or common Axioms, which are the most certain Principles of knowledge. As for example, *The same thing, under the same capacity cannot possibly be, and not bee.* Every Affirmation, or Negation, is either true or false; and so forth.

Wherefore, as we said before, no perfect knowledge, which may be called ours, is in us; but such as is in some sort derived to us from Experience, and Sense; or is at least examined, and approved by them, and strongly grounded upon some knowledge pre-existent in us. For without memory, there can be no experience, which is nothing else but a multiplied memory: neither can memory bee, without a remaining impression of the sensitive object, and the object cannot remain, where it never was.

The great Dictator of Philosophy hath another passage to this purpose. *All men naturally desire knowledge.* And this is evidenced, by the love of our Senses: amongst which we prefer the sight; because this chiefly conveyeth knowledge to us, and distinguisheth best of things. *Metaph. l. I. c. I.*

Now naturally Animals are sensitive: but some of them remember not what they perceive by sense, and some do. And for this cause

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some are prudent, some are more capable of discipline then others that remember not. Prudent, without being taught; as all those that have not the sense of hearing, as Bees, and all such other kinds of creatures; But all creatures may be taught which have both memory, and hearing too.

*Therefore other creatures have phansies, and memories, but have no title to experience. But Men have Arts, and Ratiocination. And to them experience comes by remembrance: for many recordations of the same thing, make one Experience. Wherefore experience seems much of kin to Art, and Science. For by experience men gain both Art and Science. For Experience begets Art (as *Polus* rightly notes) but Inexperience, Chance.*

*Apud.
Plat. in
Gorgia.*

By which he clearly shews, that no man can be truely called prudent, or knowing, who doth not by his own experience (attained by manifold remembrance, frequent sensation, and diligent observation) know things to be so. For without that, we think onely, or beleive: and such a knowledge as that, is to be reputed other mens, rather then our owne. Wherefore fond and erroneous is that Method of seeking truth, in use in our times: while most men diligently inquire, not what the truth is, but what other men
say

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of say it is : and inferring Universal conclusions from particular premisses, & thence shaping to themselves irrational deductions, they transmit to us things like truth, for truth it self.

Hence it is, that Sophisters and half-knowing men, polling other mens inventions, saucily impose them upon us for their own ; (shifting onely the phrase and order, and adding some impertinencies of their own) and render Philosophy (which ought to be clear and perspicuous) obscure, intricate, and confused. For whosoever they be that read authors, and do not, by the aid of their own Senses, abstract true representations of the things themselves (comprehended in the authors expressions) they do not resent true *Ideas*, but deceitful *Idols*, & *Phantasms*; by which means they frame to themselves certaine *shadows* and *Chimera's*, and all their *theory* and contemplation (which they count *Science*) represents nothing but *waking mens dreams*, and *sick mens phrensies*.

Give me leave therefore to whisper this to thee (friendly Reader) that thou be sure to weigh all that *I* deliver in these *Exercitations*, touching the *Generation of living Creatures*, in the steady scale of experiment ; and give no longer credit to it, then

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De gen. an.
l. 3. c. 1.

then thou perceivest it to be securely bot-
tomed, by the faithful testimony of thy
own eyes. This very thing did Aristotle per-
swade us to; who when he had discour-
sed much of Bees, added at last: *That the*
Generation of Bees is after this manner, ap-
pears by reason, and by those things which are
seen to come to pass after the maner of Bees. Ie
have we not a sufficient discovery of what may
fall out. Therefore when the discovery shall be
compleated, then is Sense more to be trusted to,
then Reason. For so far onely is Reason to be
relied upon, as those things which are demon-
strated, agree with those things which are
perceived by sense.

Of the Method to be observed in the knowledge of Generation.

Since therefore in the Generation of A-
nimals (as in all other things of which
we covet to know any thing) every inqui-
sition is to be derived from its *Causes*, and
chiefly from the *Material* and *Efficient*; it
seems fit to me, looking back on perfect
animals (namely by what degrees they are
begun, and compleated) to retreat, as it
were, from the end to the beginning: that
so at last when there is no place for farther
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retreat, we may be confident we have arrived at the principles themselves: and then it will appear, out of what *first matter*, by what *efficient*, and what *procession* the *plastick power* hath its original; and then also what progress Nature makes in this work. For both the first, and remoter matter, appears the clearer (being stripped naked as it were) by Negation; and whatsoever is first made in *Generation*, that is, as it were, the *material cause* of that which succeedeth. So, for example, A *Man*, was first a *Boy* (because from a *Boy* he grew up to be a *Man*;) before he was a *Boy*, he was an *Infant*; and before an *Infant*, an *Embryo*.

Now we must search farther, what hee was in his Mothers Womb; before he was this *Embryo*, or *Fætus*; whether *three bubbles*? or some *rude and indigested lump*? or a *conception*, or *coagulation of mixed seed*? or whether any thing else? according to the opinion of writers.

In the same manner, before a *Hen* or *Cock* came to perfection, (and that is called a perfect Animal, that can beget its like) there was a *Chicken*; before that *Chicken*, there is seen in the egge an *Embryo*, or *Fætus*; and before that *Embryo*, *Hieronymus Fabricius Aquapendens* hath descried the:
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rudiments of the *Head, Eyes, and Spine* of the *Back*. But where he affirms, that the *Bones* are made before the *Muscles, Heart, Liver, Lungs*, and all the *Viscera*; and that all the inward parts ought to exist before the outward; he relieth upon probability, rather than experience; and laying aside the verdict of sense, which is grounded upon dissections; he flies to petty reasonings borrowed from mechanicks: which is very unbecoming so famous an Anatomist. For he ought to have told us what daily changes his own eyes had discovered in the egge, ere ever the *Fœtus* came to perfection. Especially seeing he professedly wrote the *History of the Generation of the Chicken out of the Egge*; and hath described in pictures what progress is made from day to day. It was, I say, besitting so much diligence, to have acquainted us from the allegation of his own sight, what things in the egge are made first, what last, and what happen together: and not to have confined himself to the example of building of Ships, and Houses, to render a cloudy conjecture and perswasion only, of the order, and manner of forming the parts.

We therefore (according to the Method proposed) will explaine, first in an *Egge*, and afterwards in other *Conceptions* of
of

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of several creatures, what is constituted *first*, and what *last*, in a most miraculous order, & with a most inimitable prudence and wisdom, by the great God of nature; and at length we will discover, what we have found out, concerning the *first matter* out of which, and the *first efficient* by which, the *fœtus* is made, as also of the *order & Oeconomy of Generation*: that thence we may attain to some infallible knowledge of each faculty of the formative and vegetative *Soul*, by the effects of it; and of the nature of the *Soul* it self, by the *parts, or organs of the body*, and their functions.

Now this indeed we could not perform in all kind of *Animals*; because some of them cannot be gotten; and others again are so exceeding small, that our eyes can hardly discern them.

Let it suffice therefore that we have done it in some creatures, which are more known to us; to whose platform, the first originals of all other creatures may be reduced. We have made choice therefore of such, as might render the credit of our experiments lesse questionable, namely larger, and perfecter creatures, and such as are within our own power. For in the larger creatures, all things are more conspicuous.

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spicuous; in the perfecter, more distinct; and in those that are in our own power, & conversant amongst us, more obvious: so that we have liberty (at pleasure) by searching into them, to rescue our observations from wavering hesitation. And of this sort, in the race of *Oviparous* creatures, are Hens, Geese, Pigeons, Ducks, Fishes, Shel-fish of both kinds (as Lobsters, Oysters, &c.) Fishes that have no shells at all, Frogs, Serpents: also Insects, as Bees, Wasps, Butterflies, Silkworms. And of *Viviparous*, Sheep, Goats, Dogs, Cats, all Cattel that divide the Hoofe; and in chief, the perfectest of all creatures, Man himself.

Having thorough insight & knowledge of these things, we may then contemplate the abstruse nature of the *Vegetative Soul*; and discern in all creatures what ever, the manner, order, and causes of their Generation: because all other creatures agree either generically, or specifically with the fore-cited, or at the least with some of them; and are procreated after the same manner of generation, or else in a manner proportioned to it. For *Nature* being divine, and perfect, is always consonant to her self in the same things. And as her works do either agree or differ (namely in kind, speci-

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es, or some analogy) so her operation (that is to say, generation or Fabrick) is the same or different in them. Whoever entereth this new, and unfrequented path, and inquires for truth in the vast volume of Nature, by Anatomical dissections, and experiments, he meets with such a croud of observations, and those too in such exotick shapes, that to unfold to others the mysteries himself hath discovered, will be more toyl, then the finding of them out: for many things occur which have yet no name; such is *the plenty of things, and the dearth of words*. So that if a man should cloath them in Metaphors, and express his new inventions by old words, and such as are in use: the Reader could no more understand them, then *canting*: and would never be able to comprehend the business, ~~since~~ he never saw it.

And then again to mint up new and fictitious terms, would rather cast a mist, then enlighten. For so he must needs express things unknown, by that which is lesse known: and the Reader would be more afflicted to unriddle the words, then to understand the matter. And therefore Aristotle by unexperimented persons is thought obscure: And this perhaps was the reason, why *Fabricius ab Aquapendente* chose

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chose rather to describe the Fabrick of the Chicken in the Egge by *tables* then *words*.

Therefore be not offended, Courteous Reader, if in setting out the *History of an Egge*, and in the description of the *Generation of the Chicken*, I make use of a new method, and sometimes of unusual terms; nor think me hereby more desirous of vain-glory, then of advantaging others by true experiments, and such as are grounded in Natures self. To take off that prejudice, know, I tread but the steps of other men who have lighted me the way, and (so farre as is fit) I make use of their notions. But in chief, of all the *Ancients*, I follow *Aristotle*; and of the later Writers, *Hieronymus Fabricius ab Aquapendente*, Him as my *General*, and This as my *Guide*. For as they which finde out *new Plantations*, and *new Shores*, call them by names of their own coyning, which *Posterity* afterwards accepts and receives; so those that finde out *new Secrets*, have good title to their compellation. And here, me thinks, I hear *Galen* advising; *If we consent in the things, contend not about the words*:



OF
GENERATION.

*The Reason why we begin with
a Hennis Egge.*

EXERCITATION I.



Ieronymus Fabricius Aquapendens (whom, as I said before, I have chosen for my guide) in the beginning of his Book concerning the formation of the Egge and Chicken, hath these words: My purpose is to treat of all sorts of formation of the foetus,

taking my rise from that which proceeds from an egge; For this ought to precede all other discourses of this nature, in that it not only befriends us with a more easie discovery of Aristotles thoughts concerning this matter, but because the Treatise of framing the foetus out of an egge is much the fullest, and exceeds the other both in extent, and difficulty.

But we begin our discourse from the history of an Egge, both for the reasons by him recited, and likewise, because we may thence borrow more infallible grounds, which (in regard they are more

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known to us) may enlighten us to contemplate the *Generation* of any other *Animals*. For since *Egges* are a cheap merchandize, and are at hand at all times, and in all places; it is an easie matter to observe out of them, which are the first evident, and distinct ground-works of *Generation*; what progress nature makes in *formation*, and with what wonderfull providence shee governes the whole worke.

Fabricius goes on: That the contemplation of framing the *fœtus* out of *Egges* is the largest of all, appears in this, that the greatest part of animals are begotten of *egges*. For to pass by almost the whole race of *Insects*, and imperfect *Creatures*, which sense it self discovers to spring from *eggs*; even the most part of perfect productions are of that extraction. Hither he referreth, All sorts of *Birds*; and of *Fishes* too; (bating only *Whales*) also *Crusted-fish*, *Shell-fish*, and *Fishes* without scales;; and amongst *Terrestrials*, all *Creeping things*, *Creatures* that have numerous feet, and also all kindes of *Serpents*; and amongst four-footed *Beasts*, all sorts of *Lizards*.

But we pronounce (as shall appeare hereafter) all animals whatever, even *Viviparous* also, nay man himself to be made of an *EGGE*: and that the first conceptions of all living creatures which bring forth young, are certain *Egges*, just as the first conceptions of all *Plants* are certain *seeds*. And therefore *Empedocles* rightly stiled the *seeds* of *Plants*, a sort of *Egges*. The history therefore of *Egges* is most spacious, because it yields an insight into all kinde of *generation*.

Wherefore of an *EGGE*, we shall first shew, where, whence, and how it is made. And then, by what means, order, and degrees, the *fetus* or *chicken* is fashioned, and perfected in the *EGGE*, and of it.

Here

EXER. I. a Hennes Egge.

3

Here again Fabricius : The productions of Animals do some of them spring out of Egges, some out of Seed, and some out of Putrifaction; and hence it is, that some are called oviparous, some viviparous, others the issues of putrifaction, or creatures born of their own accord; by the Greeks, *αὐτόματα*.

But I dislike this division; because all Animals may in some sort be said to be born out of Egges, and in some sort out of Seed: besides, they are stiled Oviparous, Viviparous, or Vermiparous, rather from the issues themselves bring forth, then from the original matter of which themselves were made; namely, because they produce an Egge, a Worm, or a living Creature. Some of them are also said to be *spontaneous*, creatures born of their own accord, not because they quicken out of putrid matter, but because they are begotten by chance, by nature's own accord, and by an equivocal generation, (as they call it) and by parents of a different species from themselves. For other Animals also do bring forth an Egge, or a Worm, as their Conception, and Seed; out of which, after they have exposed it to the wide world, they produce a *fetus*, and so are named Oviparous, or Vermiparous. But now the Viviparous are therefore so called, because they retain and cherish their conception, or seed, so long within their own bowels, till the *fetus* come forth shaped, and alive.

Of the place of Generation.

EXERCITATION II.

Nature (saith Fabricius) was first solicitous of the place, which she at length decreed to be either within the Animal, or without it; and appointed the womb to be the place, within the creature; but without, the egge: in the womb, nature generates of seed and blood; but, in the egge, of such parts as the egge is made of.

For whatsoever is begotten of seed properly so called, is begun, and perfected, either in the same place, or in a diverse. All *Viviparous* creatures have both their original and perfection in the womb itself; but all *Oviparous*, as they have their foundation within their parent, and there become an egge; so are they compleated into a *fetus*, when they are divided from their parent. And, in the Catalogue of these, some creatures continue their eggs so long within themselves, till those eggs be ripe, and accomplished: and thus doe *Birds* and *Beasts* too, as many as bring forth eggs; and *serpents* likewise. But others againe expose their seed whiles it is yet unperfect and immature, to acquire its growth, perfection, and ripeness from abroad: and thus do many sorts of *Fishes*, *Frogs*; also *Fishes* without scales, and both sorts of *Shell-fish*, and *Snails*, whose eggs, when first excluded, are but *designes* or *beginnings*, being yolks onely, which do afterward invest themselves with *whites*, and by degrees attracting, concocting, and affixing aliment to themselves, become perfect seed, and a compleat egge. And of this kinde also is the

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seed of *Insects* (which *Aristotle* saith is a *Worme*) which being exposed incomplete at the first, seek their own food, and so thrive, and enlarge, from an imperfect egge, to a perfect egge, and seed. But the *Henne*, and all other *Oviparous* creatures, doe lay a perfect egge; of which, from without the womb, they hatch a *fetus*. And for this cause *Aquapendens* mentions two places assigned to generation; one *Internal*, namely the womb; the other *external*, which he calls the Egge. But (in my opinion) he might, upon better grounds, have called the *Nest*, or *Repository*, the *external* place; because in that the exposed seed is cherished, ripened, and hatched into a *fetus*. For the *Generation* of *Oviparous* creatures, is mainly differenced by their *Nest*. Nor is it less then admirable, that such little creatures should make choice of these receptacles with such exquisite prudence; and shape, build, guard, and conceale them, with such unimitable art and contrivance: whence we must needs conclude (with the Poet treating of Bees) that they are endowed with a portion of divine inspiration: and that we may easier admire their uninstruſted art and prudence, then attain unto it.

Of the Ovary, or upper part of
the Hennis womb.

EXERCITATION III.

THE womb of the *Henn* is divided by *Fabricius*, into the *Upper*, and the *Lower*; the *Upper* hee names the *Ovary*.

The seat of the *Ovary* is next under the *Liver* at the spine of the back, above the *descending trunk* of the *great Artery*. For just in that place where in bigger sanguineous creatures, the *Celiacal artery* goes into the *Mesentery*, namely, at the original of the *Emulgent veines*, or a little lower ; and in that place where the *preparing seed vessels* which go down to the *Testicles* have their rise, in all other sanguineous & viviparous creatures; & where also the cock wears his *Testicles*, there is the *Hens Ovary* found. For some *Animals* have their *stones* hanging out, others conceal them about the *Loins* within ; in a middle space as it were, at the beginning of the *preparing vessels*. But the *Cock* hath his stones immediatly adjoined to the *vasa preparantia*, as if his seed wanted no preparation. *Aristotle* indeed saith, that the *Egge* is begun at the *midriff*; but we, saith *Fabricius*, in our treatise of *Respiration*, deny that *Birds* have any *midriff* at all. Which difficulty is thus resolved: *Birds* are not quite destitute of a *midriff*; because they have a thinne membrane instead of the *midriff*; which *Arist.* calls *cinctum*, or *septum*: but they have no musculous *midriff*, as other *Animals* have, neither is it used by them for *Respiration*. But, to say truth, *Aristotle* acknowledged no muscles at all.

Thus, in one and the same breath he accuses the *Philosopher*, and excuses him too: yet hee himself is in an *Errour* the while. For it is certaine, that *Aristotle* did acknowledge muscles (as we have elsewhere observed, and demonstrated) and also that membranes in *Birds* (which are not onely placed transversly to gird the body, but are also extended according to the longitude of the belly) do supply the place of the *diaphragma*, or *midriff*, and do conduce to *respiration*: as in another place in our *Exercitations*, concerning the *Respiration* of animals,

animals, we have clearly proved. And, to say no more at present, *Birds* do not onely respire with much more facility then other creatures, but in their songs doe tune and accent their voices with manifold variety: yet, notwithstanding all this, their *Lungs* are so knit to their ribbes and sides, that they can be but very little dilated, raised up, or contracted. Besides all this, (though no man to my remembrance hath ever observed so much before) their *Bronchiz*, or extremities of the rough *Artery* are hollow as far as the very *abdomen*, and they treasure up the inspired aire in the cavities of their *membranes*. Even as *Fishes*, and *Serpents* draw the aire into large *bladders*, which are seated in their *abdomen* or belly, and so reserve it, and by that means are conceived to swim the better: and as *frogs*, and *toads*, in the Summer time when they breathe most, doe imbibe much more aire then at other times into their numerous *vesicles*, (which occasions their wondrous swelling) that so they may afford more liberall exspirations in their croaking: So in *Birds*, the *Lungs* seem rather a thorough-fare, and a passage for breathing, then the adequate organ of it. Which had *Fabricius* observed, he would not then have denyed, but that those membranes (at lest with the assistance of the muscles of the belly) doe serve for respiration, and execute the office of a *diaphragma*: since even that is not a respiratory organ, without the help of the muscles of the belly; though it have also another employment in those creatures in whom it is musculous, and fleshy; Namely, to depress the *stomack* enlarged with meats, and the *guts* distended with winde and excrements; lest the *heart* and *lungs* should be straitned by their intrusion, and the closet of life it selfe invaded. Now, since there is no fear of any

such mischance in *Birds*, their midriffe is *membranous*, and exceeding advantagious to the work of *respiration*; and for this cause they are said to have a *diaphragma*. Moreover, were birds quite destitute of a *diaphragma*, yet *Aristotle* were not to be blamed, for saying, That *Eggs* receive their first rudiment at the *septum transversum*; for by this name he onely points at the place where the *diaphragma* is commonly found in other *Animals*. So we also say, that the *Ovary* is scituate at the beginning of the *preparing spermatical vessels*, though a *Henne* hath no such vessels at all.

The *Perforation* of the *Lungs*, by me first discovered (of which I made mention but now) is in no sort dark and obscure; but, in *Birds* especially, very patent: so that in an *Ostrich* I found many *perforations*, into which I could easily thrust the top of my finger. In a *Turkey*, nay in an ordinary *dunghill Cocke*, and almost all *Birds* whatsoever, a probe being put into the *winde-pipe*, will finde an open and wide passage, clean through the *lungs* into the *cavities* of the *abdomen*, or lower belly. Blow the aire into their *lungs* with a pair of bellows, and you shall finde it hasten into the lower parts, and that not without a sensible force;

Nay, we may very well question whether, even in *man* whilest he is living, the air doth not penetrate into the *cavity* of the *chest*, by the aforefaid passages. For could otherwise the putrefied matter of *impostumated*, and the blood shut out of the veins of *pleuritical* persons, flow from thence? How could the aire, when the *breast* is wounded (though the *lungs* be untoucht) rush out of the wound? or how could *injections* cast into the *cavity* of the *chest*, be returned again with the spittle? But of this at large in our *Exercitations*, of the

III. EXER. III. of the Hennes womb.

9

the Causes, Instruments, and Use of Respiration.

I return now to the Ovary, and the upper part of the wombe of the Henne; in which the first rudiments of the Eggs are conceived, which are (according to Aristotle) small at first, and white; but increasing, afterwards become of a pale yellow.

As for this upper womb mentioned by Fabricius, the truth is, there is no such thing at all, till the Henne have conceived, and hath the principles of Eggs within her, which may then be properly called a cluster of wheals. And therefore he saith very rightly: *The superiour matrix is nothing else but almost an infinite crowd of yolks, which are amased in one heap together, being of a round figure, and of diverse magnitude; amongst which there is a like difference from the greatest to the least, as between a grane of mustard-seed and a walnu; or a medlar. This multitude of yolks are united and knit together as it were upon a bunch: and therefore I call it a Vitellary, or a bunch of yolks, because it much resembles a bunch of grapes. As Aristotle also said of fishes that want scales, where he writes, That their eggs are laid as if they were glewed together like grapes; for as in a bunch of grapes, the berries are some biggest, some less, and some least of all, and each is tyed to its proper sprig, so is it in the Vitellary.*

But now in Fishes, Frogs, hard or crusted Shellfish, and Snails, the matter is much otherwise; for they contain in them Eggs of the self-same magnitude; which being discharged, do grow alike, are perfected alike, and at the same time produce yong ones. But in the Ovary of a Henne, and almost of all other Oviparous creatures, there is a distinct increase of the yolkes, from almost an invisible smallness, till they arrive to a complete magnitude: though the Eggs of Hennes (not unlike the
eggs

eggs of those creatures which conceive and lay their eggs together) are hatched into *chickens* in the same nest, almost at the same time. Yet in *Pigeons* (which lay, and hatch onely two eggs at a time) I have observed all the Eggs in the Ovary to be of a like magnitude, excepting only those two which were greater then the rest, and were now ready to descend into the *second uterus, or womb*; so that of them there is great increase, not by the multitude of their young at once, but by the frequency of their repeated births, which happen every moneth. So in cartilaginous Fishes; as the *Thorn-back*, the *Fork-fish*, the *Dog-fish*, &c. two eggs are only ripe at a time, and falling down on both sides from the *right and left horn*, they are cherished in the *lower womb*, and exclude their young alive (as the *Viviparous* creatures do :) yet in their Ovary they have almost an infinite number of eggs, and of different dimensions; in the *Thorn-back* I have numbered above a hundred.

But the Eggs of other *oviparous* creatures are either perfected when they are out of the *womb*, as the eggs of *fishes*; or at least concocted, as the eggs of *snails*, of *hard shell-fish*, and of *spiders*. The *snails* they treasure up their eggs in froth; *crusted shell-fish*, (as *shrimps*, *cray-fish*, *lobsters*) carry them about fastned to their finnes; but the *spider* beareth them about with her, as it were in a basket wrought of her *webbe*, and so cherisheth them. The *Beetle* wrappeth her eggs in dung, (rolling them in it with her hinder leggs) and so layeth them up: and, in all these, there are an incredible number of eggs. *Fishes* have two oblong bladders, or bags, as you may see in the *Carp*, the *Herring*, and the *Smelt*; in all which, as there is no womb at all discernable, besides the Ovary, so is

lay this *Ovary* sometimes so thronged with eggs, that it far exceeds the bulk of the whole body besides.

Of the *Ovaries* of these *Carps* and *Mullets*, amass'd together, and salted, and hardned in the smoak, is made that kinde of meat so much in request with the *Greeks* and *Italians* (called by these *Botarcha*, by the *Greeks* *ωὰ νάεινα*, that is to say, pickled eggs) such as is that which is found in our red *Herrings*, & the red and compacted seed within a *Lobster*. That meat which is made of the salted eggs of *Sturgeon*, is called *Caviare*, which resembleth black sope, and is the delight of gluttons.

In all *fishes* (which have a numerous offspring) so great abundance of eggs is generated, that the whole capacity of the belly can hardly contain them, when they are newly conceived, much less when they are of any growth. And therefore in *fishes*, saving their *Ovary*, there is no other part dedicated to generation. For their eggs take growth abroad; nor need they any *womb* for that office. And this *Ovary* seems to carry some Analogie to the testicles, or little seminal bladders, not only because they are found in that place where the *stones* are bred in males; (for the *stones* in *Cocks* are scituate, as we have said, at the ingress of the *Cœliacal* artery, neere the midriff, and there the *Hens Ovary* is found) but also, because in both sexes of *fishes*, at the time of generation, there are two little bags passing through the whole belly, alike in site, figure, and magnitude; which increasing at the same time, are filled, in *males* with a similary, spermatical, and milky substance, (whence it is called *fishes milke*) and in the *females*, with little invisible graines or sands; so that in the beginning of conception (by reason of their close fabrick) they look like a similar

milar body, and like the males milk regularly coagulated, and may afterwards be discerned like the smallest sands clinging together in their proper bags.

In lesser Birds (which bring forth eggs, and those few ones, but once a year) you will scarce finde any *Ovary* at all; but just where the *stones* hang in males, there in females, instead of an *Ovary*, are found three or four bubbles (according to the number of *eggs*, whose foundation they are) as discernable as the *testicles* of the males.

In the horns of the Serpents womb (which are like the *spermatical vessels* of the males) appear the first rudiments of the *eggs*, like litle balls fastned on a string, as is usual in womens bracelets, or chaplets of beads made of amber.

They therefore that are found in the *Vitellary*, or *Ovary*, are not to be counted perfect *eggs*, but the first ground-works or rudiments of *egg*, which are in such order and magnitude disposed in the bunch, that one may daily succeed the other, to supply the *hennes laying*. But no *egg* in the *Ovary* is cloathed with a white, for onely yolks are found there; which, as they gain growth, get without the small ones; that being arrived to a larger room, they may the better thrive and enlarge. And therefore that of *Fabricius* is very true, where he saith, *The greater yolks of the bunch are in the surface, the lesser are in the middle, encompassed as it were by the greater; lastly, the least of all lie undermost.* For as they get greater bulk by growing, they are separated from their fellowes; which, while it is doing, every *yolke*, besides his proper coat, borroweth another from the *Ovary*, which encompasseth it without, and tyeth it to the foundation from whence it sprung: wherefore by *Fabricius* it is

is called *pediolus*, five *pedunculus*, the stalk, because by its means, as the fruit draweth nourishment and increase from the tree, so doth the yolk from the cluster. For this stalk is a membranous hollow fastening, which is extended from the bottom of the cluster to the yolk: which so soon as it arrives at, it is dilated, and (just as the optick nerve is spread in the eye) covereth the yolk with an outward coat. Hence Aristotle probably called it *σάλον ὑμφαλῶδον*, that is, the little umbilical appendix, or pipe. This little stalk con- De Gen. An.1.3. c. veighs with it many vessels into the yolke, through which they are many waies divaricated.

These things are indeed truly delivered by Fabricius, but he mistaketh, when he saith, This coat doth not environ the whole yolke, but onely a little more then half of it, just as the cover of an acorn, called the cup: whence it cometh to pass, that the outward part of the yolke, being deserted by the fore-mentioned membrane, is exposed to the view without veines, and appeareth naked. For it embraceth all the yolk; but in the outward part of the yolk, it is not easily discerned from its own coat, because they both are very thin. But, in the fore-part, where the yolk respecteth the foundation of the cluster, this coat adhereth not to the yolk, neither doth it send any veines into it, but only begirts it like a bag.

Every yolk assumeth a particular coat from the same foundation; and therefore this place is not to be reputed the common womb, since nothing is here to be found, beside the cluster, or heap of many eggs, of different magnitude, arising from the same foundation.

Now this Foundation is a particular body of it self, arising at the spine of the Fowle, annexed to the great Artery and Vein, being loose, porous, and fungous, that so it may produce divers yolks out of

it self, and afford each of them their coats; which coats do afterwards stretch, as the yolks enlarge, and inclose them like a Bag, with a narrow neck, but a large belly, in like manner as glass-vials are fashioned by the breath of the Glass-maker. Fabricius saith further; The yolks, as they spring from a very small original, being about the magnitude of the seed of Millet, or Mustard, so they are very litle, and white, as Aristotle observes, and do also increase by degrees; and, as the same Aristotle saith, grow like yolks and yellow, till they attain the just magnitude which every body knoweth them to be of. But I have observed them to be much less then the seeds of Millet, even as slender as the smallest wheals, or spots, or sands, (such as I have told you are found in the Ovaries of Fishes) scarce to be discovered by the eye it self, as if they were only the ruggedness of the membranes of that part from whence they proceed.

Of the Infundibulum, or Tunnel.

EXERCIT. IV.

THE next part of the Womb of the Hen, is by Fabricius called the *Infundibulum*: for it is like a Tunnel, or Trumpet, tending down-ward from the Ovary, (which it every where encompasseth) and growing wider by degrees, is terminated in the superiour production of the Womb.

This *Infundibulum* doth afford a passage to the yolks (when their stalks are broken off) into the second womb (as Fabricius thinketh) and resembleth the *Tunica vaginalis*, or coat of the Testicles in the

the *Cod*, consisting of an exceeding thin *membranes* and easie to be dilated, that so it may entertain the yolks which dayly rowle thither, and conveigh them into the aforesaid *Uterus*.

Do you desire an *Illustration* of this matter? fashion in your minde a very slender plant, whose knobby roots may represent the cluster of yolks, and its trunk the little *vaginal*, or *sheath-like pipe*: as the stalks of that herb do in the winter dye, and vanish away; so, in like manner, when the *Hen* ceaseth to lay any more egges, the entire *Ovary*, together with the *Infundibulum*, are retired, and abolished, and (like useles things) quite dried up; leaving onely the *fundamentum* remaining, and some tracks and footsteps of their roots.

That this *Infundibulum* doth onely supply the office of a *thorow-fare*, is hence enough evinced, in that the yolke is never found residing in it: but as the *Testicles* sometimes do through the *Tunica vaginalis* creep upwards into the *Groin*, and as those *Testicles* are in some creatures (as the *Hare* and *Mole*) hidden within the *Abdomen*, and do from thence again return and descend; so by the *Infundibulum* do the yolkes slide down from the *Ovary* into the *Uterus*; and it supplieth the place of that *Tunnel* (as it also hath its form and shape) through which liquors are transmitted, from one vessel into an other of a narrower neck.

of

*Of the Exteriour part of the
Uterus of the Henne.*

EXERCIT. V.

F*abricius* prosecuteth the description of the *Uterus*, after the *Ovary*, and so by a perverse method, premitteth the treatise of the *superiour* part, and *production* of the *womb*, to that of the very *womb* it self. And is also too precise and conclusive in assigning three *circles* to it, and in determining their certain scituations, when indeed themselves are uncertain. And there also he doth preposterously repeat the definition of the *Infundibulum*.

Give me leave therefore to propose here my *Observation*, and history of the *Uterus* of the *Henne*, (which I apprehend to be more commodious, according to *Anatomical* method) and to proceed from the *outward* parts to the *inward*, (contrary to the course of *Fabricius*.)

In a *Henne* that is plucked, you may perceive the *Fundament*, not (as in other creatures) gathered up into a *ring*, but having a depressed *orifice* divided *transversely*, shrunk up as it were into two *lips*, the superior of which gathereth the inferior into it, and so covereth and concealeth it. That uppermost *lip*, or *covering*, ariseth from the root of the *rump*; and, as the *upper eye-lid* covereth the *eye*, so doth this the three *orifices* of the *Privy*, (namely that of the *Fundament*, of the *Uterus*, and of the *Ureters*) which lye retracted under this covering, as under a *præpuce*, or *fore-skin*: as in the *Lap* of a *Woman*, the passage into the *womb* and *bladder* is
vailed

vailed by the *labra* of the privity, and the parts called *Nymphæ*; so that, without *dissection*, or at least some forcible retraction of that covering, neither the passage of the *Excrements* out of the guts, nor of the *Urine* out of the *Ureters*, nor of the *Egg* out of the *Uterus*, can appear in a *Hen*. And therefore those two excrements (namely the *Urine*, and the *Dung*) are rejected both together, as out of a *receptacle* common to them both, by lifting up of that covering, & so disclosing the *perforation*: and so likewise in *coition*, the *Hen* unvaileth her *lap*, and accommodateth it for the *Cock* that treadeth her: as *Fabricius* observed in a *Turkey-Hen*, which courted a *Cock*. I have seen an *Ostrich-Hen* (when her *Keeper* gently stroked her back, with designe to inflame her) groveling on the ground, lift aside that *vaille*, and expose and stretch out her *lappe*; which the *Cock* perceiving, being instantly cupid-struck, proceeded to tread her; and having one leg on the ground, and the other on her back, with an exceeding large *Yard* (of the dimensions almost of a *Neats-tongue*) pursued his attempt: great was the noise and clamours on both sides, and their necks often extended and retracted, and many other expressions of content. Nor is this proper to *Birds* onely, but common also to other *Creatures*, which by removing aside their *Taile*, and extending their *Lap*, prepare themselves to receive the *Male*. So that the *Tail* in other creatures seems to be almost of the same use, with the *Vail* in the *Hen*, which, unless it be removed, or lifted up, there is neither passage for the *excrements*, nor the addresses of the *Male*.

In *Hinds* and *Does* (as if they were more severely chaste than other beasts) such a skreen of modesty, and skinney covering, shrowdeth both the *lap*,

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and

and passage of urine, which must of necessity be lifted up, ere they can have conversation with the Male. In Beasts also that have tails, there must be an elevation of them, before they can bring forth their young. And Midwives also, by unction and retrusion of the extremity of the *os sacrum*, do facilitate womens labours.

A certain Chirurgeon of my acquaintance, an honest man, being returned from the East-Indies, told me upon his credit, that in the Island called Bornea, in the Inland and Hilly parts of it, there are a race of men born with Tails, (as Pausanias writes of another place) and that he saw a Virgin of that flock, whom they had much ado to catch, (for they are wilde) who had a fleshy, thick tail, a span long, reflected between her leggs, to conceale her modesty : such care hath nature to hide those parts.

The fabrick of this Covering in a Hen, is like to that of the upper lid of the eye, composed of skin, and of a fleshy and musculous membrane, with fibers every where drawn from the circumference to the Center ; and its inward superficies, like that of the eye-lid, and fore-skin, is soft. It hath also in its extremity a semicircular small gristle, like the Tarsus of the eye-lid : and, beside that, between the skin, and fleshy membrane, a cartilaginous interstitium, from the root of the rump joined in a right angle to the semicircular Tarsus, or gristle : (as Batts have a kind of litle taile, concealed under their membranous wings) by reason of which composition, this covering doth, as it were with a taile, shelter and hide the perforations of the privities.

The Perforations in the Fundament of a Hen.

Wherefore, no sooner is this protection cut away, but certain perforations appear, whereof some are more apparent, others more obscure. The more visible,

visible, are that of the *fundament*, and the *lap*;
namely, the passage of the *excrements*, and the en-
trance into the *womb*: the *obscurer* are, as well that
through which the *urine* flowes from the *kidnies*,
as also that smaller one found out by *Fabricius*,
into which (saith hee) the *Cock* doth immit his
seed; which *cavity* notwithstanding *Antonius Ul-*
mus a diligent dissector in *Aldrovandus* did not
own, nor any one else besides *Fabricius*, so far as I
know. These *Holes* are all so neer neighbours
the one to the other, that they seem all to consent
and pass into one and the same *cavity*; which
(because it lies in common both to the *excrement*
and the *urine*) may be called the *Sink*; because, in
it, the *excrements* of the *guts*, together with the *u-*
rine descending from the *reines*, are mixed toge-
ther, till they be together excluded. And through
this the *egge* also passing forth, worketh its way.

The making of this *cavity* is such, as if both the
excrements descended into the *Bladder*, and nature
did abuse the *urine* into a natural *clyster*. And
therefore it is something thicker and rugged
then the *gut*, and also in *ejection* and *coition*, thrusts
it self out, (the covering, as I have said, being re-
moved) and hangeth out like the inside of the
gut: and at that time all the *holes* appear distinct-
ly; which presently again upon its retraction, be-
ing collected as it were into a *purse*, are hidden
out of sight.

The more conspicuous *Holes*, (namely that of
the *fundament*, and the *lap*) obtain a contrary sci-
tuation in all *fowles*, from all other *creatures*; for
in these, the *Pudendum*, or *female genital*, is seated
foremost, between the *right gut* and the *bladder*: but
in those, the passage of the *Excrement* is placed fore-
most,

most, and between that passage and the *rump*, the passage into the *matrix*.

The Perforation of the Purse, so called by *Aquapendens*.

But that *Hole* into which *Fabricius* thinketh the *Cock* doth cast his seed, is discovered between this doore of the *matrix*, and the *rump*. But, for my part, I acknowledge no such employment of it; for, in *Pullets* or young *Hens*, it is hardly found at all; but in grown fowle it is promiscuously as well in the *Cock* as in the *Hen*. And, besides that, this *hole* is very small and obscure, and cannot therefore be imagined to be of so concerning an office; for it scarce admits the point of a small *needle* or a slender *hair*, and terminateth also in a blind and obscure *cavity*: nor could I ever perceive any *semen* at all in it; though *Fabricius* affirmeth, that the *semen* is there reserved as in a *purse*, for a whole year together, and that in the interim all the *eggs* receive *fecundity* from thence, as shall be discoursed hereafter.

The passage of Urine in a Hen.

All *Birds*, *Serpents*, *Four-footed beasts*, which are *Oviparous*, and *Fishes* also, (as is evident in *Carps*) are endowed with *Kidnies* and *Ureters*, through which the *Urine* floweth: which *Aristotle*, and other *Philosophers* hitherto knew not. But *Birds*, and *Serpents*, whose *Lungs* are *fungous*, have but very little *urine*; because they *drink* but little, and that by *sips*; and therefore they need no *Bladder* of *Urine*, but do deposit it (as we have said) into the common *sink* and *receptacle* with the dryer excrement. But in *Carps*, and some other *fishes* I have found a *Bladder* of *Urine*.

In a *Hen*, the *Ureters* descend from the *Kidnies* on both sides, (which *Kidnies* are large and ample and seated in the cavity or hollow of the back) and do end in the *cavity* or *common sink*. But the
Out-le

EXER. V. of the Uterus of the Henne.

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Out-let is so obscure, and concealed in the very entrance of the *cavity*, that to discover it from without, or to search it with the most slender probe, is altogether impossible. Nor is it indeed any great wonder; for in all creatures, even in the greatest of all, the insertion of the *Ureters* near the neck of the *Bladder*, is dark and winding, that (though *urine*, nay and *stones* too do sometimes glide through them into the *bladder*) not so much as the *aire* it selfe can go back that way, nor the *urine*, be it never so much forced.

All these things are clear in an *Ostrich*; in which I have found, beside the *outward orifice* of the common *cavity*, which was veiled by the *Covering*; another orifice within the *Fundament*, which was round and gathered up, and shut as it were with a *sphincter muscle*. But to pass these, and return to our purpose.

The *Orifice* of the *Womb*, or *Lap*; namely the passage out of the *publik cavity* into the *womb* of the *Hen*, is as it were a certain soft *protuberance* or *rising*, *loose*, *wrinkled*, and *orbicular*; just like the end of the *Fore-skin* closed up, or a *prominence* of some *interiour coat* of the *matrix*. But it is situate (as I said before) between the *perforation* of the *fundament* and the *rump*, tending something to the left hand; which *Ulysses Aldrovandus* conceives so to be disposed, for more convenient *coition*, and more commodious *reception* of masculine *incur-sion*.

The Ori-
fice of the
Uterus.

But I have often observed, that the *Henne* doth indifferently incline her *back* parts towards the *Cock*, on which *side* soever he prepare his ascent, be it on the right or left. I finde no *Penis*, or *Yard* at all in a *Cock*, neither could *Fabricius* finde any, though it appear most manifest in *Drakes*, and

Ganders. But, instead thereof, I finde an *Orifice* in a *Coek* (not different from that of a *Hen*) but it is less, and narrower; which *Orifice* is likewise found in the *Swan*, the *Drake*, and the *Gander*: but the *Penis* of the *Drake* and *Gander* (in the act of *Coition*) is sent out of this *orifice*.

In a black *Drake*, I saw a *Penis* of that extent, that after coition, the *Duck* pursued it as it trailed upon the ground, with intent to devour it; (deeming, as I suppose, that it had been a *worm*) which occasioned the *Drake* to retract it sooner then his custom is.

In a *Male-Osrich*, I found, within this orifice of the *Privy-part* a very large *glans*, or *nut of the yard*, and a *ruddy nerve*, of the form and magnitude of a *Deers tongue*, or small *Neats tongue*; which I observed him many times brandish in *coition*, stiffe, and something embowed: which, when he had dispatched into the *female*, he detained there a good space, without any commotion of these parts at all, as they had been staked together; yet all the while strange were the *gesticulations* of their *Heads* and *Necks* (as if they had approved their *Nuptials*) proclaiming their full complacence.

I have read in *D. du Val*, a most learned Physician of *Rouen*, that a certain *Hermaphrodite* was delivered up to the *Chirurgians* and *Midwives*, to determine whether he was a *Man* or a *Woman*. They, upon discovery, judged him to be a *woman*; and thereupon he was enjoined to habit himselfe like one of that sex. He notwithstanding was in the mean time accused of soliciting women, and playing the *mans part*. And at last he had a *penis* issuing out of its *hidden prepuce*, (as out of a *womans secrets*) which executed the *mans office*.

I my

I my self once saw a mans *penis* so shrunk up (excepting onely when it was provoked) that nothing appeared in the wrinkled *prepuce* above the *scrotum*, but the meer extremity of the *Glaus*.

In a *Horse*, and some other creatures, the vast dimension of that part is shut forth from *within*. In a *Mole* also, that little *Animal*, there is a great retraction of the *penis* into the *skin* and *muscles* of the *Abdomen*; and his *female* also hath a longer and deeper *Matrix* then is usual.

I conceive, it is with a *Cock*, who hath no *penis*, as it is with the lesser sort of *Birds*; which quickly conclude their acts of *coition*, and do perform them by *affricition* onely. For the *Orifices* of the *Privities* (of the *Cock* and *Hen*) by often conjunction, as by repeated salutes, do celebrate *coition*, not by one continued *injection*, (which *orifices* being turned outward, do protuberate, wax stiffe, and stretch after the manner of a *Glaus*; especially that of the *Cock*, which onely doth outwardly press upon the *female*, and, as I suppose, doth not enter in.

In the *Coition* of *Horses*, *Dogs*, and *Cats*, and other creatures, when the *male* presenteth his *penis*, the *female* proportioneth her parts stiffe, and extended. And *Birds* also that are tame, suffer themselves to be gently stroked, and swelling with *Venerial* appetite, expose that *Orifice*, which you may by your finger perceive to be hardened and resisting. Nay sometimes birds are so lustfull, that if you only gently smooth their backs, they will instantly incline, and extend and make bare their *Uterine Orifice*; which if your finger softly comply with, they will declare their accepted recreation, in extravagant murmurs, and flutterings of their *wings*. And that the *females* will even thence

conceive eggs, both *Aristotle* beareth witness, and I my self have found in a *Thrush*, a *Black-bird*, and others: and this experiment I gained long since, and by chance, but at my own cost. For my wife had an excellent, & a well instructed *Parrat*, which was long her delight; which was now grown so familiar, that he was permitted to walk at liberty through the whole house: where he missed his *Mistresse*, he would search her out, and when he had found her, he would court her with a cheerful *congratulation*. If she had called him, he would make answer, and flying to her, he would grasp her garments with his *claws*, and *bill*, till by degrees he had scaled her *shoulder*; whence he descending by her *arm*, did constantly seat himself upon her hand. If she bad him talk or sing, were it *night*, and never so *darke*, he would obey her. Many times when he was *sportive* and *wanton*, he would sit in her lap, where he loved to have her scratch his *head*, and stroke his *back*, and then testifie his contentment, by kinde *mutterings*, and *shaking* of his *wings*. I still interpreted all this to proceed from his customary *familiarity* and *obsequiousness*, for I alwaies thought him to be a *Cock-Parrat*, by his notable excellence in *singing* and *talking*. For amongst *Birds*, the *females* seldom sing, or provoke to discourse; but the *males* onely charm the *females* by the pleasant mullick of their voice, and allure them to pay their homage to *Venus*. And therefore *Aristotle* saith, If *Partridge-hennes* stand over against the *cocks*, and the winde blow from whence the *cocks* are, they conceive and grow big, and for the most part, they teem even by the voice of the *cock*, if they be at that time *wanton* and *lustfull*: and this also may fall out from the *cocks* flying over them; namely if the *cock* do transmit a fructifying spirit into the *Hen*.
And

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EXER. V. of the Uterus of the Henne.

25

And this happens chiefly in the Spring-time ;
whence the Poet :

Virgil. 2.
Georg.

*Vere tument terra, & genitalia semina poscunt.
Tum Pater Omnipotens fecundis imbris æther.
Conjugis in gremium læta descendit, & omnes
Magnus alit, magno commistus corpore, fœtus.
Avia tum resonant avibus virgulta sonoris,
Et Venerem certis repetunt armenta diebus.*

Earth swells in Spring, and fertile seed requires,
Descending Æther with her vote conspire,
And fruitful showers cheer his glad consorts hart,
Which do to all her Issues growth impart.
The Desert woods are then the shrill Birds Quire,
And all Beasts are inflam'd with Venus fire.

But not long after these kinde dalliances, the Par-
rat, which had lived many years sound and heal-
thy, grew sick, and being much oppressed by ma-
ny convulsive motions, did at length deposite his
much lamented spirit in his Mistresses bosom, where
he had so often sported. When dissecting his car-
case, (to finde out the cause of his death) I found
in the womb an egge almost completed, but, for
want of a Cocke, corrupted. Which many times
befalleth those Birds, that are immured in Cages,
when they cövet the society of the Cock.

By this and other examples, I am induced to
believe, that the Dunghill-Cock, and the Cock-Phea-
sant, doe not onely delight their Hennes by their
voices, but also do confer something by those very
voices to the conception of the egges : for even at
night, some of the Hens at roost with him, do be-
stirre themselves at the Cocks crowing, shaking their
heads and wings ; as if possessed by a gentle hor-
rour, their senses were ravished as after Coition.

A certain Fowle, as big again as a Swan, was not
long

Ornith.lib.
20.p. 541.

long since brought into *Holland* out of *Java*, an *Island* of the *East-Indies*, which fowle the *Dutchmen* called a *Cassoware*: the figure of this fowle *Al-drovandus* representeth, and saith, that the *Indians* call it *Eme*: it is not cloven-footed, as the *Ostrich*, but hath three *claws* on every *foot*; one of which is armed with so long, so hard, and so strong a *spurre*, that it will easily pierce through an *Incub-board*. Now its manner of smiting is *forward*; its *body*, *legs*, and *thighes*, are like an *Ostriches*, but it hath not a *broad bill*, as the *Ostrich* hath, but a *round* and *black* one. Instead of a *crest*, it hath upon the *head* a round extuberant *horn*; it hath no *tongue* at all; eateth any thing without distinction, be it *stones*, or *coales*, and those red-hot too, likewise pieces of *glass*; it hath two *feathers* springing out from every *quill*, and those *black*, *short*, and *thinne*, approaching to the nature of *hair*, or *down*; it hath very litle *wings*, and *imperfect*; it is a creature of a horrid *aspect*, and hath long red and blew *gills* hanging down the neck (like a *Turkey-Cock*.)

This fowle continued in *Holland* above *seven* *yeares*, and afterwards *Maurice*, the most *Illustrious* *Prince of Orange* sent it, with other things, for a *Present* to *King James*, in whose gardens it lived above *five* *yeares*: but afterward, when two *Ostriches*, *Cock* and *Hen*, chanced to be kept in the same place, and the *Cassoware* oftentimes over-heard them at the act of *coition*, being but in the next *pennes* (where they were fed apart) She unexpectedly conceived *egges* (stirred up, as I suppose. by a certain *sympathy*, from those that were something of the same kin and lineage with her) yet all that saw her, did conjecture she was rather a *Cock*, then a *Henne*, considering her *weapons* and *martiall* *provisions*. One of these *egges* she laid whole and entire,

tire, which I opened and found it compleat ; for it had a white embracing the yolk round about, together with the chalazæ, or specks like hailestones annexed on both sides, and also a little cavity or emptiness in the obtuse end of it : there was likewise the cicatricula, the little cicatrice, or whitish speck ; the shell was thick, hard, and strong, which I caused to be made into a cup (the top being taken off) such as is usually made of the Ostriches egge. This egg was something less then an Ostriches egg, but every way perfect, as I said before ; yet without all question it was but a subventaneous and an unfruitfull one, by reason of the want of a Cock. But at the same time as she brought forth the egge, I did presage she her self would die ; and that according to Aristotle, who saith, *That Birds will be sick and dye, unless they bring forth*, which fell out not long after : and dissecting her, I found an imperfect and corrupt egge in the Upper end of her Uterus, which caused her untimely death, (as I had formerly observed in the Parrat and other Birds.) Gen. an. 1.3

Most Birds, by how much the more voracious they are, so much the more fruitfull are they ; and sometimes doe without a Cock (either from high feeding, or some other cause) conceive eggs, which very seldom are either perfected, or brought forth at all, without the use of a Cock ; but they thence fall into desperate diseases, and at length dye.

But the Dunghill-henne doth not onely conceive egges, but lay them also ; and those perfect too, but yet subventaneous and barren ones. So also many of the Insects (in whose list are Silk-worms and Butterflies) do both conceive, and lay egges, without conjunction with the male, (as fishes also) but they are all addle, and wind-eggs. As if it were the same thing for these creatures to be with egge, as for virgins

virgins to have their wombs grow warm; their termes flow, their breasts increase, and (in a word) to become marriageable; which if they be too long detained from, they are assaulted with dangerous symptoms; (namely hysterical affections, or furor Uterinus) or else fall into the green sickness, and severall other distempers. For all Creatures, when they are love-struck, grow extravagant, and if debarred of enjoyment, do at length recede much from their usual temper. Hence some women grow frantick for love; and this extravagancy is so outrageous in some, that they seem bewitched, planet-strucke, or possessed. And this inconvenience would be frequent, did not pious education, respect to their reputation, and in-bred modesty, temper and assuage these inordinate commotions of the minde.

Of the Privities of a Henne.

EXER. VI.

FROM the exterior uterine orifice, is the passage to the inner parts, and matrix, in which the egge is perfected: and this passage in other creatures is termed *vagina uteri*, or *vulva*, into which the males penis is transmitted to the matrix. But in a Hen, this passage is so perplexed, and so wrinkled and folded, by reason of the laxity of its inward coat, that though there be an easie passage from the matrix outward, insomuch that a very great egge can come forth without any great difficulty; yet that the masculine penis should get in, and that the seed should finde admission into the inner cavity

vity of the *Uterus*, is scarce probable: for I could
 not trace a way inward, with either *probe*, or *bristle*,
 nor could *Fabricius* neither; nay, if you will credit
 his testimony, the very *aire* cannot be blown into
 the *womb*: which, I suppose, was the cause why
 he, describing the history of the *Egge*, proceedeth
 from the *interiour* to the *exteriour* parts: And al-
 so considering this *fabricke* of the *womb*, he deny- pag. 30.
 eth the *seed* to attain so farre as the *cavity* of the
womb, or to constitute any part of the *egge*: of
 which opinion I willingly profess my selfe. For
 you shall finde nothing at all in a fertile *egge*, ei-
 ther added, or altered, (which is not in an *addle*
 one) to give any suspicion of the entrance of the
Cockes seed into the *womb* or *egge*. But yet though
 all the *egges* are, without the accession of the *Cock*,
subventaneous and *addle*; yet by his assistance (e-
 ven for a good while after his treading) the sub-
 sequent *egges*, of which there is yet no *principle*,
 or *matter* out of which they can be made, become
 fertile. *Fabricius*, that he may express after what
 manner the *seed* of the *Cock* maketh the *egges* fer- pag. 17.
 tile, hath these words: *Since no seed at all appear-
 eth in the egge, and yet it is cast by the cock into the
 womb, it may be demanded, to what purpose the cocks
 seed is cast into the womb, if it pass not into the egge?*
*as also, if the seed be not in the egge, how can the egge
 be made fertile by that seed which is not in it? My o-
 pinion is, that the seed of the cocke injected into the be-
 ginning of the womb, doth make the whole womb, and
 also all the yolks that come into it, and lastly, the whole
 egge, fertile; and that it doth this by its vertue, or spi-
 ritual irradiating substance; after the same manner,
 as we perceive other creatures become fertile, by the te-
 sticles, and seed: for if any man consider that incre-
 dible transmutation, which doth seize upon a creature*
 that

that is gelded, by which it looseth its heat, vigour, and fecundity in the whole body; he will easily consent, that what we say, may well befall the single womb of a Hen. But that it is most true, that the power of rendering all the egges fertile, together with the womb it self, proceedeth wholly from the seed of the Cocke, appeareth, even from the practice of women, which having a Hen without a Cock, commit her for a day or two to a neighbours Cock: and from this small commerce, all the eggs are endowd with fertility, for all that year. And this is also confirmed by Aristotle, who is of opinion, that after birds have once had the advantage of coition, almost all the egges they lay afterward are fertile. Now, lest the vertue of making fertile, which is contained in the seed, should by any means exhale or evaporate, but that it may remaine long in the womb, and so be imparted to the whole; nature hath concluded, and treasured it up as it were in a purse, in the cavity neer the fundament, which is annexed to the womb, to which there is onely an entrance, but no retreat, so that the seed being there long detained, its vertue may be the better preserved, and communicated to the whole womb.

But I did doubt the verity of the foresaid experiment, and that the rather, because I perceived the Philosophers words were falsly recited; for, hee doth not say, that, Birds, when they once have had the advantage of coition, almost all the egges they lay are fertile, but, they lay almost all their egges: where the word Fertile is superadded by Fabricius: for it is one thing, to say, that Birds are with egge after coition; and another thing, to say, that those egges are made fertile by coition. And this is more manifest by Aristotles precedent words, where he saith, In Birds, not so much as those very egges which are begotten by coition, can for the most part gain their just growth,

de Gen. an.
l. 3. c. 1.

pag. 38.

growth, unless that coition be continued. And the reason is, because, that as in women by coition with the male, the menstruous excrement is drawn forth (for the womb being warmed draweth the moisture, and the pores are opened) so it falls out in birds, whilst the menstruous excrement cometh by little and little, which cannot get out, because it is but little, and is contained above about the diaphragma, but slideth down into the womb it self. For with this the egge is nourished, as the foetus of viviparous creatures is nourished with that which comes in at the Navel. For after birds have once been at tread, they still persist to have almost all their eggs, but yet small ones, and imperfect; and therefore barren: for the perfection of an egge, is its fecundity. If therefore without continued coition, not so much as those very eggs which are conceived by that coition, do attain their Growth, or (as Fabricius interpreteth it) their Perfection; much less can those eggs be fertile, which the Birds persist to lay, without coition.

But let no man think that these words (namely, the womb being warmed draweth, and the pores are opened) do any way conclude, that the womb can draw the seed of the Cocke into its cavity; for we must take notice, that the Philosopher doth not say, that the womb draweth the seed from without, but, that in women, the menstruous blood is drawn out of their own bodies, the veines and passages being opened by the heat caused by coition; and so likewise in Birds, that the blood is drawn to the womb, it being warmed by repeated coition, and that the eggs do thence encrease; as the fetus of viviparous creatures do by the Navel. But what he adjoineth concerning that cavity or purse, in which he fancyeth that the seed is entertained, even for a whole year together, is confuted by us formerly; where
we

we affirm, that no seed at all is contained in it, and that both henns and cocks indifferently have that cavity.

Wherefore, though I easily believe (if by fertility we understand an *encrease* of more and fairer eggs) that poor womens henns (whose poultry probably wanteth good feeding) will lay lesser and fewer eggs, except they have resort to a cock (according to that of the *Philosopher*, namely, If they once mixe with a cocke, then they continue to have fairer, better, and more eggs, for the whole ensuing year; to which end also, plenty and wholesomeness of feeding do very much conduce) yet that henns, by some few acts of coition with a cock, should lay all fertile eggs for a whole year together; that, I say, seemeth to me improbable. For if a few acts of coition were of force to so lasting a generation, Nature (which maketh nothing in vain) would have made the male birds less salacious then they are: nor would the cocke so often in one day invite his henns to *Venery*, nay sometimes force a rape upon them.

Wee all know, how the henn, so soon as she forsaketh the nest where she hath layed her eggs, crieth out with a shrill voice, and enticeth the cock to coition; who also replying with a loud and divided tone, carefully seeketh her out, and having found her, instantly ascendeth: which surely Nature had never permitted, but for procreation sake.

A Cock-Pheasant, penned up in an aviary, boileth with such scorching lust, that unless he have several henns with him, (six at the least) he will extremely afflict them with repeated Coitions, and rather retard their fertility, then promote it. I once saw a Pheasant-henne, so spent and worn out

by the cocke who was shut up with her (whom she could no wayes escape, neither by flight, nor concealment) that her back was grown bald by his frequent ascents, untill at last, in miserable torture, she expired for grief. Yet, when I cut her up, I found not the leſt rudiment of an egge. I have observed likewise a Gander, who wanting a mate, sojourned with the hennes, where his lust was so unbounded, that for some hours together he pursued a young pullet whithersoever she fled, arresting her with his bill, till at length he triumphed upon her weariness; and subdued her to a Rape.

A dunghill-cock having gotten the mastery in the duel, doth ſate his desires not only upon the concubines of his foe, but upon the conquered himself.

So likewise some females are so prone to Venerie, that they will chastise their males with their biteings; (as if they meant to whisper and advise them of conjugal delights) sometimes getting uppermost themselves, endeavouring by these and other arts to entice them to their recreation: and in this rank are pigeons, and sparrows.

And therefore it seems not so likely, that a few coitions celebrated in the beginning of the yeare, should store up fecundity enough, to endow all the eggs for a twelve-moneth following.

And yet once (that Fabricius may have some patronage) in the Spring time (attempting some discovery of the time wherein coition is most successful, and the necessity thereof) I did separate two hennes from the cocke for foure dayes space, which in that time laid three egges a piece, which were as prolifical as the rest. And I did after that immure another henne, which on the tenth day of her separation laid an egge, and another egge on the twentieth, and both were fruitfull: so that it may

seem possible, that one or two acts of conjunction may fructifie the whole cluster, and consequently all the egges of that year.

I shall tell you likewise, what I farther observed at that time; when I restored the two *henne*s (which I had formerly divorced) to the *cocke* again, whereof one of them was now big with egg, the other had newly *laid*; the *cock* ran instantly to the *latter*, and enjoyed her greedily three or four times: about the *former*, he circuited often, and by trailing his *wings* at her feet, seemed to greet her kindly, and congratulate her return; yet presently retired to the *other*, and repeated his lust again, and again, committing violence upon her refusal; neglecting in the mean time the *henne* that was with *egge*, using no solicitation nor request. Truly I admired, by what significations he could be inspired to know, that *coition* could be *usefull* to the *one*, and *unseasonable* to the *other*. It is not easie to say, how males will either by the eye, ear, or smell, distinguish (even from farre) which *females* are ripe for their turne, and desirous of their company. Some, though they onely hear their voice, or sent their *urine*, or *foot-steps* only on the ground, are presently heightned, and pursue them to compliance. But of this elsewhere, in our tract of the Love, Lust, and act of Generation of Animals, we shall treat at large. Wee returne to our purpose.

*Of the Belly of a Henne, and
other Birds.*

EXERCIT. VII.

FROM the outward Orifice through the privy parts, we arrive at the *Uterus* or *matrix* of the *Henne*, wherein the *egge* is perfected, encompassed by the *white*, and covered with the *shell*; but before we speak any thing of its *scituation*, and *position*, something must be premised, concerning the peculiar anatomy of the *Belly of Birds*. For I have observed the *stomacks*, *guts*, and other *entrals* of Feathered creatures, to be otherwise seated and constituted in their lower belly, then of other creatures that go upon the ground.

All kindes of *Birds*, almost, have a twofold *stomack*, whereof one is the *Ingluvies*, the other the *Ventriculus*, properly so called: in the former they treasure up their *meat*, and prepare it; in the latter, they digest it, and concoct it into the *chyle*: the first, we call the *crop* or *craw*; the latter, the *Gisard*. *Birds* reserve in their *craw* the whole grains which they ingorge, and from thence transmit them into the *gisard*, moistened, macerated, and softened by the water which they imbibe, that it may there be grinded, and concocted. And for that purpose, almost all sorts of *Fowle* swallow down *sands*, *stones*, & other harder bodies, & reserve them in their *gisard* with their *meat*; (when no such thing is to be seen in their *craw*) and this *gisard* of theirs is compacted of two exceeding thick & strong *muscles*, (which in lesser *Birds* are composed of *flesh* or *ligaments*) that with these two, as it

were with two *Grind-stones*, fastned together with two *binges*, they may grind and mould their food; whilst the *stones* supply the place of *teeth*, of which they are destitute. By this means they digest and *chylifie* their meat, and afterward by *compression* (as we strain a juice or a *pultis* out of *herbes* or *fruits* bruised) the *softer* and more *liquid* part lyeth uppermost; and that they conveigh into the beginning of the *guts* (which in them is just at the entrance into the *gullet*, seated above the *gisard*. Now that this is so, appears in several sorts of *Birds*, in whose *gisard*, if *gravel*, or any other harder and rugged *bodies* continue any time, they receive so much impaire and smoothness from the continual *attrition*, that at last they grow useles, and so are ejected. And for this cause *Birds* exercise their *tongues* in the choice of their *pibbles*, and if they discover that they are not *rough*, they presently *refuse* them. By this means I have found *Iron*, *Silver*, and *Stones*, almost worn away and consumed in the *gisard* of an *Ostrich*, and the *Cassoware*; which gives occasion to the popular *perswasion*, that they digest *Iron*, and are nourished by it.

In *Falcons*, *Eagles*, and other *Birds of Prey*, if you bring your *ear* near, when their *gisard* is empty you shall evidently discover the noise of *stones* collected in it, grating one against another. For *Hawkes* doe not swallow *pibbles* to coole and alay their *heat*, (as the common sort of *Falcons* dream) but to grinde their *meat*: as also other *Birds* (whose *gisard* is made fleshy on purpose to mould their *meat*) for the same intent, do ingorge *pibbles*, or *sand*, or such like *bodies*.

The *gisard* of *Birds* therefore, is seated within the capacity of the *Abdomen*, beneath the *Heart*,
Lungs

Lungs, and *Liver*; but the *crop* sticketh (for the most part) as it were out of the *body*, in the *lower part of the necke*, at the *Os Jugale*: in which (as I have said) their meat is onely *mollified*, and *prepared*: and from it some *Birds* return their meat macerated to their *chickens*, and nurse them up (at the same rate as *four-footed beasts* doe theirs with *milke*) as you may observe in all sorts of *Pigeons*, and also in the *Spermologi*, which we call *Rooks*. And *Bees* also, when they are returned to their *Hives*, do refund the *bony* which they gather from the *flowers*, and have digested in their *stomack*, into their *proper celled*: and so do *Hornets* and *Wasps* nourish their off-spring. And a *Bitch* hath been seen to disgorge the meat which she had swallowed before, and half concocted, to supply her *whelps*. Wherefore, the wonder is less, when we see poore *beggar-women*, when their *milk* faileth them, to feed their *Infants* with *scraps*, which their owne *teeth* have first prepared, and reduced into a kinde of *pap*.

The *Guts* in *Birds* arise (as is said) from the upper part of the *Gisard*, and are replicated up and down in *Longitude* (not *transversely*, as in *us*.) And next to them, just under the *heart*, about the middle of the *body*, where the *diaphragma* (which is wanting in *Birds*) is seated in *Beasts*, is their *Liver*, which is very large, and divided into two *lobes*, (for they have no *spleen* neither) placed on either *side*, and fills the *hypochondria*: below the *Liver* is the *gisard* put, under which lye the *replications* of the *intestines*, having very many slender *membranes* interposed, which are filled with *air*: for into these (as we have said) the rough *arteries* of the *lungs* descend with open mouth. The *kidnies* (which are large in *Birds*) being of an *oblong* fi-

gure, composed as it were of gobbets of flesh, having no cavities at all, doe lye on both sides of the Spine, and great descending vein and Arterie, and are buried in the spacious oblong cavity of the huckle bones or sides-men. From the fore-part of the kidneys are the Ureters extended in Longitude, even to the common sinke, and fundament it self: that so the serous excrement may from the Reines be waisted thither. Now Birds have very little of this serum, because they are small drinkers, and some of them (as the Eagle for one) drink not all. Nor doth their urine flow apart by its self; but, as we have said, doth distill from the Ureters into the common receptacle, which is allowed also to entertain the excrement of the guts, whose discharge is by this means the better provided for. The urine of Birds differeth from that of other creatures; for the parts of their urine are two-fold, one more serous, and liquid, the other more gross and thick, which in men in health we call the hypostasis, and when the urine is now cold, it sinketh down to the bottom: now Birds (clean contrary to other viviparous Animals) have greater store of this thick sediment; which is distinguished from the other part of the urine, by its white or silver-like complexion, and it is not only discernable in the cloaca or sinke, (where it much aboundeth) and giveth a tincture to the excrements of the guts: but in the whole conduct of the Ureters, which are distinguished from the coats of the kidneys, by this very white excrement. Nor is the thicker substance which descendeth from the Reines, only visible in Birds, but in Serpents also, and other oviparous creatures; especially those whose egge is guarded by a harder kinde of shell. And they have much more abundance of this, then of the thin-

per serous part : and it hath a middle consistence between a *thicker kinde of urine*, and the *excrement of the guts* ; so that as it passeth through the *Ureters*, it resembleth *milk coagulated*, or something thickned, and presently upon ejection it congealeth into a *crust* that is friable.

*Of the scituation and fabrick of
the rest of the parts of the
Womb in a Hen.*

EXERCIT. VIII.

BETWEEN the *Gisard*, and the *Liver*, at the *Spine of the backe*, where in men and other animals the *Pancreas* lyeth, between the *vena Porta*, and descending trunk of *vena Cava*, at the beginning of the *Emulgent vcines*, and the *preparing spermaticall vessels*, where the *Cœliacal artery* goeth into the *Mesentery*, there also in a *Henne* and other *Birds*, is the *Ovary*, and cluster of yolkes bred, which hath Before it the *Trunk of the Vena Porta*, the *gullet*, and the *mouth of the Gisard* ; and Behinde it, the *Hollow vein*, and the *Great Artery* descending by the *Spine of the backe* ; Above it lyeth the *Liver*, Under it the *Gisard*. And therefore the *Infundibulum*, which is constituted of a very thin membrane, descendeth down-ward from the *Ovary*, all along the *back*, between it and the *Gisard*. And from the *Infundibulum* or *Tunnel* (between the *Gisard*, *Guts*, *Reines*, and *Loynes*) the *Process* of the *Vierus*, or its superiour part, having many *revolutions*

tions and cells (like the Colon & right-gut in a man) descendeth into the *Womb* it self. But the *Womb* it selfe, which is continuous to this *Proceß*, is seated below the *Gisard* at the *Fundament*, at the lower end of the *Abdomen*, between the *loynes*, *kidnies*, and *right-gut*: so that when the *egge* now cloathed with the *White* is contained in it, it preffeth down so low, that you may easily perceive by your finger, whether it be soft, or hard, and ready to be layed.

This *Womb*, in a *Hen*, is of different magnitude and fabrick: For in a *Henne* which is big with *egge*, or hath lately layed, it differeth very much from the *womb* of a *Virgin-henne*, or *Pullet*; for her *womb* is fleshy and round, lik an empty purse; smooth without, within rough, having certain folds and revolutions according to its *longitude*: at first sight, you would conceive it to be a larger kinde of bladder of *Urine*, or a second lesser *gisard*. But in a teeming *Hen*, and one ripe for the *cocke* (which our housewives distinguish by the redness of their crest, or comb) the *Uterus* is of much better growth, and more *carnous*, having larger folds, and thicker, and of that extent, that it may conveniently receive an *egge*. And this *womb* is extended and passeth upward a good way, along the *Spine* of the *back*, and is made up of many complications and cells; (as the *Collick-gut* is) which several cells are composed of the replications of the *womb* it selfe. The *Bottom* hereof, as it is the largest, so it is the thickest, and most *carnous* part of all, fortified with more and greater foldings then the rest, whose figure within is *Ovale*, as if it were the Mould to cast *egges* in. I call the *Ascending* part, or production of the *Womb*, a *Proceß*: *Fabricius* calleth it, the second *Uterus*, and saith it consists of three rundells

or turnings : *Ulysses Aldrovandus* calleth it the stomach of the womb : there are, I confess, most commonly three spires or rundels, yet this is not so constant, but that nature fashions it otherwise, for varietie, (as she doth sometimes in the circumginations of the Colon.

This womb, the higher it goeth, the slenderer and sparer it groweth by degrees, and hath fewer and lesser circumvolutions, till at length as it were dissolving into very thin membranes, it becomes to be the *Infundibulum*, which arising up as farre as the *diaphragme*, encompasseth all the Ovary.

And therefore *Fabricius* divideth his second womb into three parts ; viz. the beginning, the middle, and the end. The beginning, saith he, degenerating into a slender and most soft membrane, frameth a wide orifice, representing as it were a little pipe or tunnel. The middle part (which I call the Process of the Uterus) is constituted of three transverse spires or Rundels, and serveth to furnish the yolk of the egge with a white, and extendeth it self to the lowest and most capacious place or part of all ; which he calls the End of that Uterus, wherein (saith he) the *Chalazæ*, or specks, and the two membranes and shell are formed.

The whole substance of the Uterus (especially about the folds) as well in the Uterus it selfe, as in its Process, is embroydered with many large veines, and yet there are more divarications of Arteries then of Veines.

The Folds which in the inside of the womb are oblique and transverse, are of a fleshy substance, and look exceeding white and milkey, breathing forth a kinde of stiffe moysture ; so that the inward superficies both of the Uterus, and also of its Process, is lined as it were with very much, and thinne whites of egges ; by which meanes the descending yolk gaires

gaines greater bulk, and cloatheth it self in white by degrees, till it arrive at full perfection.

You shall seldom finde the *Uterus* unfurnished of eggs, but that there are some still either sticking in the revolutions of the *Process* of the womb, or else contained in the *Uterus* or womb it selfe. If you blow up this *Process* when it is empty, it will appear like a litle oblique distorted pipe, rising up sharp at the end in manner of a *snailles shell*, or a *Top*. And the *Fabrick* of the womb is like that which wee lately observed in the *privy parts*; namely, that though there be open way enough to receive the egge in its *descent*, yet there is scarce any return to be obtained upwards again, (even for the *air* it self, though backed by *inflation*.)

The *Process* of the *Uterus*, together with the *spires*, is so diminished in a *Hen* past laying (as we have said) and also in young *pullets*, that it resolveth into most thin *membranes*, and is quite abolished, and leaveth no appearance of it, as neither of the *Ovary*, or *Infundibulum*; only there remains (like the root of the cluster) a *glandulous* and *spongy* substance, which tasteth pretty sweet in a *boyled Hen*; as in *Viviparous* creatures (especially if they be young and tender) the *Pancreas*, and *Thymus* doe; which therefore the people call the *Sweet-Breads*.

The *Womb*, together with its *Process*, is by the helpe of a *membrane* fastned to the back: which *membrane* *Fabricius* doth therefore call *Mesometrium*; because, the second womb, together with this *membranous* body, wherein many *veines* are *divaricated*, may fitly be compared to the *Intestines*, and their *Mesentery*. For as the *Mesentery* keepeth firm the *Guts*, so doth that *Mesometrium* fasten this long *Process* from the *chine*, lest being dislocated, and involved,

Ex. VIII. of the parts of the Uterus of a Hen.

43

volved, it should disturb and obstruct the passage of the yolks, whereas now being free and open, it entertaineth them gently. Through this *Mesometrium*, many vessels stored with blood, are branched into every replication of the womb. And therefore it beareth much analogy to the *Mesentery*, both in its beginning, substance, fabrick, use, and office. There is also a *Ligament* (like a *fillet*) extended long-ways from the bottom of the womb to the *Infundibulum*, such a one as we may see produced in the upper region of the *Colon*; which is as it were a portion or fragment of the outward coat, going along and contracted, that the rest of the *Process* might by its help be wrinckled into folds and replications. Thus, if you cut off a gut, and put in a thred into it all along the whole length of one side of it, and then tye it hard, the other opposite side will curle up into wrinckled complications and windings.

This then is the Constitution of the womb of a *Henne* that layeth egges; namely, fleshy, large, durable and extensive into length and breadth, full of windings, spires, and convolutions all along the spine of the back from the fundament, upwards, and continuous to the *Infundibulum*.

 of

Of the generation of the Egge.

EXERCIT. IX.

THe *yolk*, in the *cluster*, is onely a litle wheate
 or *push*, and growing by degrees, attaineth
 the complexion and bulk of a *yolk*; and falling off
 from the *cluster*, it descendeth through the *Infundibulum*; and rowling through the *Spires* and *cavernes* of the *Process* of the womb, doth cloath it
 selfe all over with the *White*: though (as *Fabricius*
 rightly observed against *Aristotle*) it doth adhere
 to the *womb* no where at all, nor is it nourished
 by any *Umbilical vessels*: but as the *egges* of *frogs*
 or *fishes*, provide themselves *whites* out of the wa-
 ters wherein they lie; or as *beanes*, *pease*, and o-
 ther *pulse* and *graine*, being moistened, do swell,
 and thence acquire aliment to the blossoms which
 spring from them: So in like manner out of the
aforesaid foulds of the *womb*, an albugineous hu-
 midity issuing thence (as it were out of a *dugge*,
 or *Uterine cake*) the *Yolk* (by vertue of a *vegetative*
 heat, and faculty wherewith it is endowed) find-
 eth out, and concocteth its *white*. And therefore
 in those *foulds*, and in the *cavity* of the *Uterus*, a
 liquor, in tast much like the *white* of an *egge*, doth
 most plenteously abound. And in this sort the
yolk descending by little and little, is invested with
 a *white*, until at last, assuming *membranes*, and a
harder shell in the *extremity* of the *womb*, he is com-
 pleted for his Exit.

*Of the Growth and departure of the
Egge from the Womb.*

EXER. X.

Attend Fabricius: as we pronounce (saith he) pag. 8.
the action of the Stomack to be Chylification: and
the action of the Testicles to be the Generation of
Seed; because we find chyle in the Stomack, and
Seed in the Testicles: So we confidently affirm the
Action of the Birds womb, to be the Generation of egges,
because there we finde the eggs. But this is not the on-
ly Function of the womb, but the Augmentation of the
egge also, which succeedeth immediately after the
Generation, till the egge be perfected, and purchase
a just enlargement, is implied. For the Henne doth
not naturally lay her egge, before it be compleat, and
have attained a convenient magnitude. The Action
therefore of the Uterus is both the Generation, and
Augmentation of the egge: Now Augmentation sup-
poseth Nutrition, and includeth it. But since all
Generation proceedeth from two Principles; namely,
the Efficient, and the Subject Matter: The Efficient
in the procreation of egges is nothing else, but the In-
struments, or proposed organs, namely, the twofold
Uterus: and the Subject Matter, is nothing but
Blood.

But we, for Brevity sake (omitting, as is meet,
all controversie) as we do easily allow, that the use
and office of the womb, is to procreate egges: so
we pronounce the *Adequate Efficient* (as they call
it) to be contained in the egge it selfe: and wee
do conceive that both the Generation, and Aug-
mentation of the Egge, proceedeth not from the
womb

womb, but from an innate natural principle of its own : And that this Principle doth flow first from the whole Henne, into the Yolk while it yet is only a radiment, or first wheale as it were ; which afterwards like a congenial heat, or Efficient Nature) inherent in the Yolk, nourisheth and Augmenteth it : As there is a certain in-bred faculty in every part of the Body, by which it is fed and augmented. As concerning the manner how the Yolk is invested with the White, Aristotle seems to have conceited it to be thus : That there is in eggs, while their membranes are yet tender, a kind of Umbilicall channel, existent in the sharper end of the eg (at which he determineth the eg to begin) by which it increaseth : which perswasion Fabricius reprehendeth, denying any being at all to any such channel ; Or that the Yolk doth any where adhere to the womb : and salveth that scruple concerning that small appendix found in the egge after it is layed, saying ; The augmentation of the egge is two-fold, according to the two-fold womb, that is the superior, and inferior : and also, according to the two-fold substance, whereof the egge is compounded, that is, the Yolk and the White ; the Yolk is increased by a true Augmentation ; namely, by blood ; which is conveyed to it by the Veins, whilest it is yet adjoynd to the Vitellary. But the White is increased, and groweth to the yolk, after another fashion : For it receiveth no nourishment by the Veins, nor by a true kind of Nutrition, as the Yolk doth but by Juxtaposition, adhering to the Yolk, while it passeth through the Second Uterus.

PAG. II.

But in my Opinion, the Egge is augmented after the same manner (wheresoever it be) as the yolk is augmented in the cluster, viz. from an Intrinfecal concocting principle, with this distincti-

on onely, that while it is in the cluster, its aliment is conveyed to it by the *vessels*, but in the womb it findeth it ready for it to imbibe. For in all Nutrition and Accretion, a Juxtaposition of the parts is equally necessary, and also a Concoction and Distribution of the applied *nutriment*; nor can the one be thought to be lesse a True Nutrition then the other: for both of them are made by a new *accession*, *apposition*, *agglutination*, and *transmutation* of the *Aliment*. Nor can *Beanes* or *Pease*, which attract moisture from the Earth (which they suck in like sponges) be said to be lesse truly nourished, then if they did draw in that moisture through the *Orifice* of *Veins*: And *Trees* also drinking *Dewes* and *Showres* in at their *Barks*, are as truly nourished, as they are by their *Roots*. But concerning the manner of this Nutrition, we have spoken more largely in another place. At present, it remaines that we encounter another *difficulty*; that is, whether the *Yolke*, while it acquireth a *White*, doth not make some separation, and choice in it: and so, while it is about augmenting, whether some more earthy part be not dismissed into the *Yolk* or middle of the egge, (as into the Center, as *Aristotle* would have it) and the *lighter*, and *thinner* parts be not reserved in its *superficies* or surface: For between the *Yolk* which is yet in the cluster, and that which is in the midst of the *eg* when it is perfected, this is the difference in chief, that though the former be yellowish in colour and appearance, yet its consistence representeth rather the *White*; and being sodden, *thickneth* like it, groweth *compact*, and *viscous*, and may be cut into slices. But the *Yolk* that is in the midst of a perfect egge, being boiled, groweth

groweth friable, and of a more earthy consistence, not thick and glutinous like the White.

Of the Egg-shell.

EXERCITATION XI.

pag. 22.

IT is convenient, that having declared how the *Egge* is generated, wee should now treat of its parts, and their differences. An *Egge* is compounded (saith *Fabricius*) of a *Yolke*, a *White*, two *Chalazæ*, or specks, three membranes (namely one membrane proper to the yolk alone, and two other, common to the whole *egge*) and last of all, of a *Shell*. To which, two things are to be added, which may not be truly ranged amongst the parts of the *egge*; one whereof is a certain small cavity in the blunter end of the *egge* near the top of the *Shell*; the other is a certain little white print, like a small round *Cicatrice*, affixed to the superficies of the yolk. The account of every of which we shall lay down more punctually, beginning from the outward parts. The outward Covering (which is by *Pliny* called the *Barke*, *Rind*, or *Paring*; and by *Q. Serenus*, the *Egg-shell*) is a hard, slender, friable, and porous tegument, having divers colours, namely, white, pallid, red, spotted, and sprinkled with several pictures: to wit, the *Hens*, and *Pigeons* egg-shells are white; the *Water-fowles*, pale; the *Hawkes*, or *Kestrells*, red as *Vermilion*; the *Pheasants*, spotted, and distinguished with points, as *Aristotle* noteth. All eggs have not a shell; for *Serpents* eggs have none; and some hens (though rarely) lay eggs without a shell.

de Hist. an.
l. 6. c. 2.

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This shell, though it be hard, is not equally hard in all parts, but is more hard about the top, and superiour part of the egge. And therefore Fabricius saith, It is a question, when the egg-shell is formed, and out of what subject-matter. For Aristotle and Pliny affirm, that the shell is not made within, but when the egge is laid, & as it is going out; so that the outward beat dry-
 ing up the moisture, the Air condenseth & hardneth it. And this is done, as Aristotle supposeth, both that it may have the easier passage, and also that it may not pain the parent: As they say that an egge softned in vinegar, may be crowded into a vessel of a narrow neck.

Fabricius indeed was long at odds with this opinion, by reason he had found an egge with a hard shell in the belly of the Hen; an experiment which is daily proved by house-wives, whilest endeavouring to know whether the Hen be ready to lay, they grope the belly without, to try whether the shell be hard. But afterwards, when he had received from creditable women, that the egg-shell assumed its obduration from the air in its exit, which air doth exiccate a stiffe moisture which environeth the egge, and condenseth and fastneth it to the shell, before the shell of it self be ex-
 ceedingly hard: and having also discovered the same by his own experience, he altered his opinion, and was perswaded, that the egge in the Uterus hath truly a shell, which shell is of a middle consistence, between soft and hard, but that it obtaineth a much greater degree of obduration presently after it is layed, by reason of a certain clammy tenacious humidity which condenseth about the shell, occasioned by the evaporation of the thin and moist parts; with which humidity the whole superficies is bedewed, which adhering to the tenacious shell, is dried and hardned, the cold ambient air inducing something thereunto. And this (saith he)

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 de gen. an.
 1.3.c.2.

you may soon perceive, if you keep Hennes in your yard, and be dexterous and diligent to receive the eggs from them, as they lay.

This opinion of *Aristotle* did for a long time prevaile with me, till I discovered the contrary by infallible experience. For I take it as a measured truth, that the *Egee-shell* is most commonly hard even in the womb it self. And I once saw an egge cut out of a live *Henne*. which had no shell at all, but yet was througly drenched and begirt with a glewey moisture: and yet the egge never hardned at all, by the congelation, or evaporation of the moisture about the *Skin*, (as *Fabricius* would have it) nor was it any whit altered by the ambient cold aire, but continued the tendernesse which it had in the womb. I have also seen a New-laid egge, which had a compleat hard shell, over which was a case made of a cuticular soft membrane, which membrane did never congeal. Moreover I have seen an egge exactly surrounded with a Shell, save only on the very top of the acute end of the egg, where remained a smal soft rising, such a one as *Aristotle* perhaps conceived to be the Reliques of the Navel.

And therefore *Fabricius* seemeth to me to be in an errour; for though I was never so good at slight of Hand, to surprise an egge in the very laying, and so make discovery whether it was soft or hard; yet this I confidently pronounce, that the Shell is compounded within the womb, of a substance there at hand for the purpose: and that it is framed in the same manner as the other parts of the egge are, by the *Plastick faculty*: and the rather, because I have seen an exceeding small egge, (*Fabricius* calleth it *Ovum Centenium*, and our Women call it the Cock's egge) which had a

Shell

EXER. XI. *Of the Egg-shell.*

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Shell of its own, and yet was contained within another egge, greater, and fairer then it, which egge also had a Shell too. And this Egge I shewed King Charles my most gracious Master, in presence of many others. And that very year, cutting up a large Limon, I found another small, but yet a perfect Limon in it, which had also a yellow ynd: Which thing is now frequent in Italy, as I am informed.

It is the usual error of the *Philosophers* of these times, to seek the diversity of the *causes* of *Parts*, out of the diversity of the *matter*, from whence they should be framed. So *Physitians* affirm, that the different parts of the body are fashioned and nourished by the different *materials* of *Blood*, or *Seed*; namely the *softer parts*, as the *Flesh*, out of a thinner matter; and the *more earthy parts*, as the *Bones*, &c. out of grosse, and harder. But this error now too much received, we have confuted in another Place. Nor are they lesse deceived, who make all things out of *Atomes*, as *Democritus*; or out of the *Elements*, as *Empedocles*. As if (forsooth) *Generation* were nothing in the world, but a meer Separation, or Collection, or Order of things. I do not indeed deny, but that to the Production of one thing out of another, these fore-mentioned things are requisite: But *Generation* her self is a thing quite distinct from them all. (I finde *Aristotle* in this opinion) and I my self intend to clear it anon; that out of the same *White* of the *Egge* (which all men confess to be a *similar body*, and without diversity of *Parts*) all and every the parts of a *Chicken*, whether they be *Bones*, *Clawes*, *Feathers*, *Flesh*, or what ever else, are procreated and fed. Besides, they that argue thus, assigning only a *Material cause*, deducing the causes of

Natural things, from a voluntary or casual concurrence of the *Elements*, or from the several disposition or contriving of *Atomes*: they doe not reach that which is chiefly concerned in the Operations of Nature, and in the Generation, and Nutrition of *Animals*: namely, the *Divine Agent*, and *God of Nature*, whose operations are guided with the highest artifice, providence, and wisdom, and doe all tend to some certain end, and are all produced, for some certain Good.) But these men derogate from the honour of the Divine Architect, who hath made the *Shell* of the *Egge* with as much skill, for the *egges* defence, as any other particle; disposing the whole out of the same matter, and by one and the same formative faculty.

Now though what I have delivered is very true, (namely, that the *egge* whilst it is yet in the womb, is guarded with a hard *Shew*) yet I have still prized *Aristotles* judgement so highly, that I never would recede from his Oracles without premeditation; and therefore I do conceive (which thing also my own observations do confirm) that some accession to the induration of the *egge-shell*, doth accrew from the ambient air in its very exit: and that, that stiff and slimy moisture, (wherein it is drenched at its being laied) doth presently after its exclusion harden. For the *Shell*, while it is yet in the womb, is much thinner, more transparent, and of a smoother superficies: But after laying, it is much thicker, lesse translucent, and of a rough Superficies (as if it were rough cast with a white powder, which had newly dried to its sides.)

And now we are upon this subject, give me leave to expatiate a while.

In the *Eastern barren Islands* of *Scotland*, there is such a mighty affluence of all-most all sorts of *Sea-fowle*, that if I should relate all that I have heard, though from persons of great integrity, I fear I should be suspected more Fabulous then those several Authors, who discourse of the *Scottish* or *Soland-Geese*, which they story to be born from the fruit of certain Trees falling into the Sea (which fruit or *Geese*, themselves never saw) However I shall venture to relate what my owne Eyes have seen.

There is a little *Island*, the *Scots* call it *Basse*, (by this, *Reader*, guets at the rest of them) it is not far from the shore, seated in the *Main Sea*; standing upon a rugged and dangerous Clift, (you may call it rather one great continued *Stone*, or *Rock*, then an *Island*) it is not above a mile about. The superficies of this *Island* (in the moneths of *May* and *June*) is almost covered quite over with Nests, Egges, and Young-Ones, that for their infinit abundance, you can scarce set your foot in a spare place, and such a mighty flock hovereth over the *Island*, that (like thick clouds) they darken and obfcure the day: and such a cry, and noise they make, that you can hardly hear those that stand next you. If you look down into the Sea beneath you (as from a steep Tower, or Precipice) you shall see it all spread over with several sort of fowle, swimming to and fro, in pursuit of their Prey. Just at the rate, as some ditches and lakes in the Spring time, are paved with *Frogs*; and open Hills, and steep mountains, are stuck and embossed with flocks of sheep, and Goats. If you saile round the *Island*, and look up into the several Clifts, and Cavernes of it, you shall finde them all peopled and inhabited with several colonies

lonies of Birds and Fowle, of distinct Kinde, and magnitude: more indeed, then in a clear night, when the Moon is absent, there are Starres to be discerned in the Firmament: and if you observe the severall Regiments of those that sailly out, and those that flocks home wards at the same time, you would take them for an infinite swarm of Bees. It is not to be imagined what a vast yearly revenue the *Lord of the Island* maketh of the *Plumes*, and the Remainders of the *Nests* (which are useful for firing) together with the *Egges* which hee seetheth, and then trafficketh away: that which he himself told me, was indeed incredible. But this one thing which reflects neerer upon our discourse, seemeth to me remarkable in chief, and doth give a cleer testimony of the excessive multitude: which is, that this *Island* as you approach it, shineth with a white glasing, and the cliffs resemble mountaines of the purest Chalke, though the native complexion of the Stone be obscure and black. That which thus discoloureth the *Island*, is a *white crust*, which is *friable*, and of the very same *Consistence*, *Complexion*, and *Nature* with the *Egge-shell*; so that all parts of the *Island* are plaistered over with this *hard tegument*, and crumbling or *friable crust* or *shale*. The bottome of the *Island* which the *Tyde* washeth every day, retaining still its natural colour, clearly sheweth that that *fucus*, or *sophisticated whiteness*, proceeds from the liquid *Excrements* of the *Birds* (which they discharge when they disburden their *Bellies*) and by which, as it were with an *Egge-shell*, white, hard and friable, the *Walls* are cruisted and disguised: And after the same manner, doe *Aristotle* and *Pliny* consent, that the *Egge-shell* is formed. None of these *Birds* are Citizens of the place, but
 Forreigners

Forreigners all, and resort thither for convenient Laying, and there they continue some weeks as in their *Inne*; till they and their Young-ones be all in condition to fly away together. But that white *Kuff-cast* is so solid, firme, and thick, that you would think it were the genuine and natural substance of the *soile*.

This liquid, white, and bright *Excrement*, doth glide with the *Urine* from the *kidnies* of the *Birds* through the *Ureters*, into the common *cavity* or *fakes*, and there covering over the *excrements* of the *guts*, passeth forth together with them, and it is a thicker part of their *Urine*, then that which we call the *Sediment* or *Hypostasis* in ours. We have spoken something of this matter before, and wee have demonstrated it fuller elsewhere.

Store of this white *excrement* is there chiefly to be seen, where the *Hawkes* defile the *walls* that do neighbour their *pertches* with their ejections, which they be-dawb with a glewy white, and distinguish as it were with a *Ceruse*.

I have found as much of this slimey cement in the repository of a dead *Ostrich*, as would fill ones *hand*: so also in a *Land-Tortoise*, and several other *Four-footed creatures*, that are *Oviparous*, this white *plastering-stuff* doth abound; and being disloaded, the thinner parts evaporating, it doth soon congeale either into a *friable crussy substance*, or into a *dust* or *powder*, resembling the *egg-shell*, pound- ed in a *Morter*.

Amongst the so many several *kindes* of *Birds* (which make their conflux to the aforesaid *Island* for *Procreation* sake) and so many several *structures* of their *nests*, wherein they hatch their young, there was one *Bird* shewed me above all the rest, which layeth one onely *egge*, fixing it upon the

steep point of a sharp stone, (having neither nest, nor any other materials to support it) and that so secure, and firmly, that the mother-bird can leave it there, and return again to it at pleasure, without any prejudice to the egge at all. But if this egge be once removed from its station, no art nor cunning in the world can fasten it again, but it instantly falleth into the sea, as from a precipice, without redemption. The reason is, because the place where it is mounted, is incrustated all over with the white cement; and the egge being newly layed, wreaketh with a stiff and viscous humidity, which presently congealing, it is agglutinated to the subjacent stone, as it were with a kinde of soulder.

An example of so nimble a concretion as this, we may see at the Statuaries, who out of calcined Alabaster, or certain mortar tempered with water, doe make a liquid cement; which being artificially applied, will take off the figure of the countenance of a dead man, or the shape and resemblance of any thing whatsoever, be it never so litle; and so that growing hard, remaineth for a Mould.

As therefore in almost all liquors there is some earthy consistence, (as in Wine, there is the Tarrar; in Water, mudde or sand; in Lie, salt; which when the greater part of the moisture is exhaled, doth subside, and congeal at the bottom) so is there a white sediment, descending with the urine from the Birds kidneys into the common Fakes, with which I did conceive the egge was there incrustated, and plaistered over; as the pavements are by Hawks, and the cliffs of the fore-said Island by the numerous conflux of Birds and Fowle: And thus Chamber-pots, and places where people urine much, use to be over-cast with a yellow crust, from the

con-

concrecence of that substance, which createth
stones in the *kidnies* and *bladder*, and other parts of
the *Body*. I did, I say, conceive (especially being
induced thereto by the authority of *Aristotle* and
Pliny) that out of this white *hypostasis*, which doth
much abound in all *Oviparous* creatures, (whose
eggs are encompassed by a hard *shell*) the *fabrick*
of the *Henns egg-shell* was erected, and congealed
(upon exclusion) by the cold *ambient aire*. And this
opinion is so rooted in me by many other experi-
ments, that I can hardly forbear to believe, that
some part of the *shell* at least, is produced from
thence.

But (as *Fabricius* rightly adviseth) let reason be
silent, where experience warranteth the contrary; for
it is too much the crime of the age we live in, to
obtrude opinions built upon conjecture, and slender
reasoning, as infallible truths (without any testi-
mony at all from sense.)

For I am certainly assured from Experiment,
that the *egge* (at least here in *England*) is adorned
with its *shell*, while it hath its abode in the *Womb*,
though *Aristotle* and *Pliny* affirm the contrary, and
Fabricius also is not very obstinate in the nega-
tive. Perchance indeed in hotter countries, where
the *hennes* are of a stronger constitution, the *egges*
are commonly layed soft, and without *shells*, but
that is very rare amongst us. So when I was at
Venice, *Aromatarius*, a famous *Physitian*, shewed
mee a small leaf formed between the two *shales* of
a *Pease cod*, though with us in the like case there
is onely a small knob of the future *pulse* to be seen.
So much doth the indulgent temper and clemen-
cy of the *Heavens*, *Soil*, and *Aire*, conduce to the fe-
cundity, and happy increase of things.

Of



Of the rest of the parts of the Egge.

Of the rest of the parts of the Egge.

EXERCIT. XII.

WHere, how, and when the rest of the parts of the egge are generated, we have partly declared already in the history of the Womb; and shall partly mention hereafter, when we come to treat of their Use.

pag. 22.
The
White.

The *White* (saith *Fabricius*) is by *Pliny* called *Ovi albus liquor*; by *Celsus*, *Ovi candidum*; by *Palladius*, *Ovi Albor*; by *Apicius*, *Ovi album*, and *albumentum*; in Greek, λευκόν; by *Aristotle*, ὡς λευκωμα; by *Anaxagoras*, ὀρνιθῆ γάλα, *Lac avium*, the Milk of the Bird. And it is the cold, stiffe, white liquor of the egge, of different thickness, (for at the obtuse and acute end of the egge it is more fluid, but more crasse in other parts) and quantity (for it is in more abundance at the blunt end of the egge, and less at the sharp, and yet still less in the other parts) embracing the yolk round about.

But I have ever observed in a *Hennes* egge, not onely a difference in the same *White*, but two distinct *Whites* in the same egge, and both of them involved in a peculiar membrane of their own: One of which is more thin and fluid, and almost of the same consistence with that humor which we have said to flow in the folds of the *Uterus*, and to constitute and nourish the *White*. The other *White* is more thick and viscous, & dyed of a deeper white colour than the other; which in stale, and such eggs as the *Hen* sitteth on, after some dayes of her *Incubation*, waxeth yellowish; and as this thicker *White* doth immediatly surround the yolk, so doth the li-

quid

liquid *White* encompasses this. Now, that these two *Whites* are really distinct, will soon appear; if after you have broken and removed the *shell*, you prick the two *membranes* which come next to hand; for then presently this liquid and exterior *White* will runne about, and the two *membranes* sink to the *bottom* of the *bason*: but the grosser *White* will all the while keep within its own *bounds*, and globous *figure*, as being terminated with its owne proper *membrane*, which yet is so subtle and slender, that your eye cannot perceive it; but if you cut it cross the *White*, it will presently stream out, and lose its round *figure*: as when a *bladder* is divided, the moisture contained therein is set at liberty; and so also if you make a breach upon the proper containing-coat of the *yolke*, the saffron-coloured juice will issue out, and its former globosity be destroyed.

The *Yolke* (saith *Fabricius*) is called in Latine *TheYolk.* *Vitellus*, from *Vita*, Life; because the chicken liveth pag.23. upon it: It is also called from its colour *Ovi Luteum*, the yellow of the Egge; in Greeke, *χρυσόν*; by Hippocrates, *χλωρόν*; by Aristotle, *ώχρον*, and *λίανθρον*; the Antients (as *Suidas* out of *Menander*) *ποπρόν* that is, the pullus, or chicken; because they conceived the chicken was bred of that part. It is the softest juice that is in all the egge, and confined within a most thin membrane, which being broken, it presently gliderh forth, and is then inconstant to any figure: it is treasured up in the middle of the egge, being sometimes yellow, and sometimes of a mixed complexion, betwixt yellow and pallid; it is exactly circular, and of divers magnitude, according to the diversity of the magnitude of the Fowles themselves; for *Water-fowle* have a larger yolke, and *Land-fowle* a larger *White*, *Hist.an.l.* saith Aristotle. According to whom also, The yolke 6.c.2. and

and White are of a contrary nature, not in colour only but power; for the yolk is condensed by cold, which cold doth not condense the white, but dissolve it. And so on the contrary, the white is condensed by fire, but the yolk is not condensed thereby, but remaineth soft unless the egge be over-rosted; being more dried and hardened by being boyled then roasted. And as in the greater world, the earth is deposited in the Center, the Air and the Water being round about it, so also the yolk, as the more earthy part, is incircled by the two whites, whereof the one is grosser, the other finer. Nay (Aristotle addeth further) if a man beat many egges together in a bason, and boyle them with a soft and gentle fire, the yolks will in their entire mass gather themselves orbicularly into the midst, and the whites surround them. Yet Physicians generally do decree the White to be the colder part. But of that more hereafter.

Hist. an. l.
6. c. 2.
de gen. an.
l. 3. c. 1.

The Chalaza.

The Chalaza, that is, the Hail-stones, or little pearls or specks, like Haile (which the Italians call Galladura, and wee the Tredde) are two in every egge; one seated in the obtuse, the other in the Acute Angle of the egge. The major part of both which is found in the white, but yet they adhere closer to the yolke, and are annexed to its membrane. They are something oblong bodies, more congealed, and whiter then the white it self, knotty, and in some sort transparent, as Hail is, from whence they borrow their compellation: for every Chalaza containeth several hail-stones as it were, glewed to one another by the white. One of these Chalaza is larger then his fellow, and more distant from the yolke, towards the blunt end of the egge; the other smaller, and tendeth from the yolke to the sharp end of the egge. The larger of these two is made up of three knotty substances, like haile-stones, or

seed-

seed-pearles, which are placed a small space one from the other, the lesser lying behinde the greater.

In all eggs of all Birds whatsoever, whether they be fertile, or addle, these *chalazæ* are to be found, and that in each end, one; whence the fond persuasion of old Wives, that the *chalazæ* are the Cocks seed, and the subject matter out of which the chicken is procreated, lyeth waste, and overturned. And yet Fabricius himself, though he absolutely deny that they are made of the seed of the Cock, yet he laboureth with many arguments, to prove, pag. 48. that they are that immediate matter, which the Cock endoweth with fecundity, and out of which the fabrick of the chicken is erected: which he endeavoureth to convince by this fraile ground, that (forsooth) in an egg when its boyled, the *chalazæ* are in such sort contracted and shrunk up, as that they represent a conception, or chicken shaped, and hatched. But how improbable a thing is it, that every egg should have two seeds or rudiments, for the constitution of one only chicken, when no man living ever yet beheld any foundation or progress of a chicken, but only in the blunt angle of the egg? And moreover, there is no sensible difference at all between the *chalazæ* of those eggs which coition hath made fruitful, and those which are altogether barren. But this worthy man was mistaken in the intent of the *chalazæ*, which shall appear more clearly hereafter.

In the eggs of the least Birds of all, you may track these *chalazæ*, which appear there like a fine thread, or slender nerve. But in the two ends of the eggs of the Ostrich and Cassoware, I have seen exceeding thick, long, and white *chalazæ*, consisting of many little globous bodie, of different dimension.

In

The Ca-
vity.

In the *blunter end* of the *egge*, neer the *shell* in the inside, you may discover a litle small *cavity*, or *hollowness*; which is sometimes exactly at the top of all, and sometimes inclining to one *side*, almost directly opposite to the *Chalaza* which is at the other *end*: the figure of it is most commonly *circular*, but in a *goose* or *duck-egge* it is not so precisely *round*. This *cavity* you may plainly see, appearing like a cloudy *spot*, if at night you hold an *egge* against a *candle* in one *hand*, and lay the other *hand* transversely upon the *obtuse angle* of the *egge*.

In a *new-layed egge* it is but litle, seeming in *magnitude* of the bigness of the *ball* of a *mans eye*; but it increaseth dayly, according as the *egge* groweth *staler*, and the *weather hotter*.

After one dayes *incubation*, it spreadeth mainly, as if some thinner part of the *white*, which lyeth uppermost, were exhaled, and the rest contracted, and so the space grown wider. For this *cavity* resideth between the *shell*, (which in that place hath no *membrane* to line it) and that outward *membrane* which containeth all the liquidities of the *egg*. All eggs whatever have it, nay, I have found it in the eggs which remain as yet in the *Uterus* of the *Henne*, so soon as ever they assume a *shell*. Some that pretend to cunning in this matter, will prognosticate, that if this *cavity* be directly in the *top* of the *egge*, the *chicken* then will be a *cocke*, but if it deflect to the *side*, it will be a *henne*. But this is most certain, if the *cavity* be very small, it signifieth the *egge* is *new-layed*, but if it be any thing large, a *stale* one. But more largely of this hereafter.

The Cic-
atrice.

There is a very small *white circle* embracing the coat of the *yolke* (in fashion of a small *Cicatrice*)

Ex.XII. Of the rest of the parts of the Egge.

63

which *Fabricius* therefore calleth *Cicatricula*; but he setteth litle by it, counting it rather a *blemish*, then a *part* of the egge. This is a very litle *spot*, about the bigness of a small *Lentile*, like the ball of a Birds eye, being *white*, *flat*, and *round*. And all egges have this too, even from their very first *original* in the yolk. And therefore *Fabricius* is deceived, while he fancieth this *spot* to be nothing but a *relique* of the *stalk* broken off from the yolk; by which it was incorporated to the *cluster* in the *Ovary*. For the *Pedunculus* or *stalk* (as himself acknowledgeth) is *hollow*, and as it approacheth neerer to the yolk, it dilateth it self, that it may encompass it round, and shut it up as in a litle bag or purse; for it is not fastned into the middle of the yolk (as the *stalks* of *Apples*, and other *Fruits* are) that so it should leave a *relique* behinde it, when it falleth off. Now if sometimes in a very fair yolk (as *Fabricius* reporteth) you chance to finde a double *Cicatrice*, it may probably occasion a *Monster*, or *Twinn*, (as shall be discoursed hereafter) but doth no way import a double *stalk*. But he is extremely overseen, in thinking this *Cicatrice* to be utterly useles: for it is the most *material*, concerned part in the *whole* egge, for whose sake all the rest of the parts are *created*, and the *original* and *foundation* out of which the *Chicken* it self is formed. And *Parisannus* doth falsly contend, that this is the *Cocks* seed.

of

Of the difference of Eggs.

EXERCIT. XIII.

THere is a two-fold acceptation of the word Eggs proper, or improper. An egge in its proper Acceptation is that thing, to which Aristotles definition of an egge doth square : An egge is that thing, one part of which doth constitute an Animal, and the rest doth nourish it, when it is constituted. In its improper acceptation, it is that to which Aristotles definition about the same place is proportioned. An Egge is that thing out of which the whole Animal is constituted. And of this kinde are the eggs of Ants, Flies, Spiders, some kinde of Butterflies, and many other very small egges of that kinde : which Aristotle doth almost every where scruple to call by the name of eggs, but stileth them little wormes. Thus far Fabricius, but we (whose designe is chiefly to treat of the generation of Hen-eggs) have no intention to deliver the severall distinctions of all sorts of Eggs, but only to lay down the diversities of Hen-eggs. Of Hen-eggs therefore, some are new-laid, and some staler, the former are whiter then the later; for time doth cloud them, and especially incubation. The New-laid also have a very small hollownesse or cavity in the obtuse angle ; and if they be very new indeed, they are something rough with a dust, or powder that sticketh to their sides ; but those that are stale, as their complexion is darker, so their shell is smoother. New-layed eggs (if they be whole) being put near the fire will sweat, and are of much pleasanter taste, and more esteemed of, then other. And eggs after two or three dayes incubation

Hist. an. l.
1. c. 5.

de gen. an.
l. 1. c. 2.

pag. 19.

The distinction
and difference of
Eggs from
their Age.

are even then sweeter relished then stale ones are: as if the cherishing warmth of the Hen, did refresh and restore them to their primitive excellence and integrity. And after full fourteen days (when the Chicken now beginneth to be downey, and extendeth his dominion over half the eggs, and the yolke is almost still entire) I have boyled an egg till it was hard, that so I might discern the position of the chicken more distinctly, which was lined out in the white of the eggs, as if the chicken had been cast in a Mould: and yet the yolke was as sweet and pleasant as that of a new-laid egg, when it is in like manner boyled to an induration. The yolke of an egg taken out of a live Hen, and presently eaten, tasteth much sweeter raw, then dressed.

Eggs are likewise distinguishable from their figure; for some are longer, and sharper then others. Out of these oblong and acute eggs (according to Aristotle) are hennes begotten, and of the blunt, cocks. But Pliny saith the contrary; The rounder sort of eggs (saith he) breed Hennes, the other, Cocks. And Columella is of his minde too: If one would have good store of Cocks (quoth he) let him place the longest and sharpest eggs under his Hen; and if the contrary, let him provide the roundest he can get for money. Aristotle's opinion is grounded upon this reason; namely, because the Rounder are the better; for it is the custom and condition of heat, to congregate, and fix; and that heat is most powerful, that is most operative. And therefore from the strongest, and perfecter principle, the stronger and perfecter Animal doth arise. Now such is the Male respect of the Female (especially the Cock being compared to the Henne.) And now on the other side, the lesser sort of eggs are reputed imperfect,

From their Figure.

Hist. an. l. 6. c. 2. l. 10.

c. 52.

lib. 9. de Rust. c. 5.

Scaliger upon the place.

and the least sort of all, utterly *improbable*. And therefore *Aristotle*, to procure a constant race of egges of a fair size, recommendeth the frequent coition of cock and hen; for he concludeth the barren and *subventaneous* egges to be all of the lesser sort, and more insipid; and that because they are mossier and imperfecter then others. Now this distinction of egges here spoken of, is to be understood of the egges of one and the same hen (for should a hen lay egges alwaies of the same dimensions, she would alwaies hatch them all cocks, or all hennes) because if you take it otherwise, the conjecture of which will be a cocke or a henne, raised from the signes above mentioned, will be very dubious. For several hennes lay egges of a several shape, and magnitude: for some lay oblong, some rounder, and little differing the one from the other. For though I have sometimes found a difference in the egges layed by the same hen, yet the distinction is so exceeding small, that unless a man be very well versed, he will not perceive it. For since all the egges of the same henne, are cast and modelled in the same womb (as in a Mould) they are all impressed with, neer upon, the same figure: and therefore it cannot be avoided, but that they should much resemble one another (as those excrements that are figured in the same complications of the same Colon) inso much that I my selfe have with ease in a little basket of egges sorted every hennes egges by themselves. And who ever practiseth it, shall be nimble at it. Certainly it is worth our wonder, which dayly experience declareth in Keepers. The more diligent sort of Keepers of Parks, that have the charge of several herds of Deer, will tell you punctually which and which are the Hornes of such and such Deere, as often as they come their

their Heads. A silly, ignorant Shepherd, who had the care of a great flock of sheep, grew so well acquainted with every particular sheep, that if any one were missing (though he had not arithmetick enough to count them) he could punctually tell which it was, of whom it was bought, and whence it came. And once, to make tryal of him, his Master commanded him, out of forty lambs which he penned up in a Fould on purpose, to single out the particular lamb of such an Ewe, which he did exactly, and carried to the Damme. I know some Huntsmen, that if they have once seen a Deer, or the horns of a Deer, or footsteps only in soft ground, are able to know the same Deer again from all the Herd besides, even by those very horns, or tread: (just as the Lion is distinguished by his Paw) nay having merely seen the print of the Deers hoofe, they will exactly resolve, how large the Deer is, how fat, and how swift: as whether he be well in breath, or over-hunted; and also, whether a Buck or a Doe. And more then this, there are some, who when forty Dogs are pursuing the Chase, and are in full Cry, will distinguish them all, (though a great way off) and will by their ear inform you, which Dog is first, and which behind; which hunteth upon the sent, and which at a loss; whether the Deer be still in flight, or at a Bay, & disputing the conquest with his horns; whether he have stood long, or be newly rowled. And all this in the very midst of the dogs, hunters, and windings of the horns, even in a woody Park, and where they were never in their lives before. We are not therefore to wonder so much, if those that practise it, can discover which Egge belongs to which Hen: I would we could as easily judge which Sex belongeth to which Father.

From
their Fe-
cundity.

de Re rust.
c. 1.

But the chiefe difference of Eggs consisteth in this, that some are fruitfull, and some addle, which are called *Opa improlifca*, *irrita*, *Hypenemia*, or *subventanea*, and *Zephyria*. They are called *Hypenemia*, which being layed by the Hen without conference had with the Cock, are therefore of no use to the generation of Chickens, being stiled by *hypenemia*, quasi a vento prognata forent, as if they were begotten by the winde: as Varro saith, that Mares in Spain conceive by the Winde. For the West wind is exceeding fruitfull, and thence the name *Zephyrus*, quasi Ζευφός, enlivening; forso *Virgil*:

————— *Zephyrique tepentibus auris*
Laxant arva sinus, superat tener omnibus humor,
Parturit omnis ager, &c.

————— And when warm *Zephyrus* blows,
The fields dissolve, soft moisture overflows,
And every Pasture grows.

Hist an. l.
6. c. 2.
Pliny lib.
10 c. 54.

And therefore the people of old, seeing their Hens in the Spring-time lay, this wind then blowing, did conceive *Zephyrus* to be the Author of the generation of those eggs. Eggs are likewise *Urini*, and *Cynosura* (when the Hen will sit no longer upon them) so called, because egges grow often addle in the Dog-dayes, for the benne deserted them by reason of the extream Heat; or else because about that time of the year, it thundereth often: for Aristotle saith, that Egges rot, if at the time of the Hennes incubation it chance to thunder. Those egges are esteemed *fecunda*, fruitfull, which (if there be no outward impediment) by a quickning heat will generate chickens; which may be effected not onely by the incubation of the Hen, who

whose egges they are, but of any other Fowle of competent magnitude to cherish and cover them, or by any other cherishing warmth whatsoever.

For Aristotle saith, That chickens are as well Ibid.
hatched upon the ground of their own accord, as by the birds incubation: As in Egypt they cover the egges with dung. And the Story goeth, That a good fellow of Syracuse sate so long upon a mat under the which eggs were layed, that ere he had done tipling the chickens were hatched. The Emperesse Livia is also reported to have cherished an egge so long in her bosom, till the chicken was bred. And to this day in Egypt, and other parts, chickens are hatched by stoves and ovens. An egge therefore (as Fabricius pag. 19.
truly affirmeth) is not only the Uterus, and place of residence of the chicken, but the matter also on which the whole generation of the fatus doth depend: which generation the egge doth performe and accomplish, both as Agent, Matter, Instrument, Place, and ever other Requisite whatsoever. For certain it is, that the chicken is constituted by an internal principle in the egge, and that there is no accession to a complete and perfect egge, by the Hennes incubation, but bare cherishing and protection: no more then the Hen contributeth to the chickens which are now hatched, which is onely a friendly heat, and care, by which she defendeth them from the cold, and forreign injuries, and helpeth them to their meat. And therefore the Incubation of the Henne is required, that she may upon that relation undertake the education of the chicken, instruct and direct their walks, prepare and look for their feeding, and by the comfort of her wings cherish them. And all these things will not be so well performed by any but her. We have indeed Capons, and yungrel-fowle, such as are the is-

sue of a *Pheasant-cock* and a *Dunghill-henne*, which will sit upon the *egges*, and hatch them too, but they have no dexterity to guide the *chickens*, or manage the *charge* of their *education*.

I can here but admire (intending to treat larger hereafter of the same matter) with what constancy and patience, almost all *female Birds* will out-sit whole nights and dayes, and impare their *healths*, and almost *famish* themselves; and to what hazards they expose themselves in defence of their *eggs*, which, if upon necessary occasion they are at any time constrained to leave, oh! how earnestly, and with what dispatch doe they hasten their return! *Ducks*, and *Geese*, for the time of their absence, cover their *eggs* with straw. And with what undaunted resolution will these feeble parents many times combat in right of their *egges*, which perhaps are *subventaneous* or *adde*, nay sometimes *artificial of-springs*, the issues of *chalk* or *ivory*, whose injuries yet they will revenge with the same magnanimity, with those done to their *legitimate productions*? Indeed the *Birds* affection towards the dull, liveless *egge*, is exceeding wonderful, which is altogether incapable of making any return of *friendship* or *respect*. Who can forbear to be amazed at the affection, or phrensie rather of a *Henne* that is *glocking*, or ready to sit, which nothing can extinguish, but a deluge of cold *water*; for so long as this rage is upon her, she groweth quite careless, and walkes like a *bedlam*, with her *wings* trailed, and *feathers* rough, and advanced, and she her self mournful, and restless: if she meet with any *Henne* sitting, she will depose her, having all her thoughts bent upon *egges* and *incubation*; nor will she desist, till shee either get *egges* to sit upon, or *chickens* to discipline: which

EXER. XIII. Of the difference of Eggs.

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then she doth assemble, nurture, feed, and protect with admirable zeal. Who can refrain smiling, to see a Henne follow young Ducklins, and having hatched up that supposititious brood (apprehending them to be her own) pursue them when they are now swimming in the Pond, while she her self circuites about the brimmes, and many times attempts to sail after to the hazard of drowning, still calling, and enticeing them back, as if they had mistaken themselves.

Aristotle giveth this reason why steril egges produce no chickens, namely, because the juices contained in them receive no thickening by incubation, neither doth their yolk or white recede any thing from the nature they were of before. But of this wee shall discourse hereafter, in our general contemplation of Generation.

Our women, that they may distinguish between egges that have chickens in them, and egges that are barren and addle, after the fourteenth or sixteenth day from the Hennes first sitting, do gently drop the egges into warme water, and those that sink to the bottom they account barren, but those that swim, fertile. And if the chicken in the egge be of any considerable growth, and bestirre himself lustily, the egge will not onely tumble up and down, but leap and caper. And if you listen close for some dayes before exclusion, you may perceive the chickens kick, make a noise, and cry after their manner. Which kinde of Commotions when the Sitting Henne discovereth in her nest, she removeth the egges, and rowleth them to and fro, (as careful mothers do their disquiet and peevish infants in the cradle) till the chickens being accommodated with convenient posture, lye hushed, and still.

Hen-eggs are likewise distinguished from their

From Number.

Hist. an. l.
6. c. l.

Number. For some Hens (saith the Philosopher) lay all the year long, baying onely 'the two Winter moneths. Some gallant Hens will bring sixty eggs before the sitting time; yet these are not so fruitfull as the ordinary sort of Hens. The Adrian Hens are small, but lay every day; yet they are very testy, and many times kill their chickens; and their feathers are of changeable colours. Some domestick Hens will lay twice a day, and the fecundity of some, shorteneth their dayes.

Some Hens in England lay every day; but the ordinary fertile race, for the most part, lay for two dayes together; namely, the first egg in the morning, the second in the evening following, and the third is a day of vacancy. Some Hens have an unlucky custome to break their eggs, and leave their nests; but whether this be their disease, or vice, is yet unresolved.

Incuba-
tion.

There are differences also taken from Incubation; for some Hennes sit once, some twice, others thrice, and some oftner. Florentinus writeth, that certain Hennes, Natives of that Alexandria which is in Egypt, called *Monosira*, of whom springeth a race of Game-cocks, doe sit two or three times, having the chickens which they have newly hatched taken from them, & brought up apart. By which means it cometh to pass, that one Hen will hatch forty, sixty, and sometimes more chickens at one sitting.

Magni-
tude.

Some Eggs also are of a large, some of a less, and some of the least size of all; and these last are commonly called in Italy, *Centenina*; and our Women, to this day, (as of old also) bely them to be Cocke eggs, and that they produce Basilisks. The Common people (saith Fabricius) think this small egge to be the Hennes concluding production, after she hath layed in hundred eggs (from whence it is called *Centenina*, the Hundredth egge) which hath no yolk at all; yet

pag. 10.

hath

all the other parts, as the Chalazæ, the Whites, Membranes, and the Shell. For it is likely that this is then layed, when all the yolkes are already completed into Eggs, and there is no more remaining yolke in the Vitellary, that may become eggs; but yet on the other side, there is still some little White behind, and of that Modicum of White it is probable this little Egg is framed. But this seemeth not probable to me; because it is an assured truth, that when the Ovary is exhausted, the Second Uterus also (as himselfe confesseth) is also spent, and wasted into a meer membrane, not containing any residue of the White, or Moisture at all. Fabricius goeth on: There is found a two-fold Ovum Centeninum, one without a yolk, (and this is properly called Centeninum) which is the last the henne layeth, with which the henne concludeth her Laying for that season: the other also is a very small egge, but hath a yolke, and is not the concluding, but some intervenient egge, after which the henne doth persist to lay egges of a just magnitude, as before; but it faileth in its dimensions, by reason of some impair in the vegetal faculty, as it happeneth to Peaches, and other Fruits, whereof some are of a full growth, and others exceeding small. He might have accused for this mischance, the inclemency of the Aire, and Soile, also the penury, and pravity of the nourishment. But, that the last Egges are alwaies very litle, I cannot willingly consent.

Nor are even Egges without their Monsters. For Aldrovand. Ornithol. l. 14. pag. 260 the Augurs (saith Aristotle) did account it Ominous, when Egges were laid that were all yolke; or when such egges were found in the henne, she being cut up, under the Septum Transversum, and they of the magnitude of a Perfect Egge.

And hither may be referred Ova Gemellifica, Twinne-eggs, which are furnished with two yolkes; such

such as I lately found in the *Uterus* of a *henne*, being complete, and guarded with a *Shell*, having *Tolks*, *Cicatrices*, and the *grosser Whites*, all double: it had also four *Chalazæ*; but, as for the *White* of thinner consistence, there was onely *One*, which did encompass all the rest: it had also two onely common investing *Membranes*, and one single *Shell*. For though *Aristotle* affirme, that some *hennes* alwaies produce such *Eggs*; yet, that it so happeneth by the course of nature, I can hardly believe. And though two *chickens* may be hatched out of such *Eggs*, (which I have experimented, contrary to *Fabricius* his perswasion, who saith, that of such an *eg*, the *chicken* hatched will have four legs, two heads, & four wings; of which hereafter) yet they are not vital, but commonly dye soon, and that either for defect of *Aire*, or room in the *Shell*, or that one is an impediment to the other, and doth violence to it; for it cannot be, that both should be equally ready and ripe for *Exclusion*, and that one should not prove an *Abortion*.

To summe up all: The Differences of Eggs are chiefly of three kinds: For some are Fertile, and some *Addle*; some produce *Cocks*, and some *Hens*; some spring from Parents of the same species, and some from Parents of a diverse species, and so bring *mangril-chickens*; such as are conceived from a *Dun hill-hen*, and a *Cock-Pheasant*, and so resemble either the *Cock* that obtained the first, or last *Coition*.

Hist. an. l.
6. c. 2.

For, according to *Aristotle*, the *egge* which is constituted by *Coition*, passeth from its own kinde into another, in case the *henne* proceed to *Coition*, (having either a barren *egge* in her, or else an *egge* conceived by the semen of *cocks* of different kinde before she hath procured its white. And thus are barren eggs fructified,

Justified, and fruitfull eggs entertain the form of that
 cocke, who had the last courtesie in Coition. But if the
 White be already obtained, it cannot be, that either
 barren eggs should be altered into fruitfull; or that
 those eggs which are already conceived by Coition,
 should pass into the kinde of that cock who was last en-
 tertained. For the Cocks semen is (as Scaliger sharp- *In loc.*
 ly observeth) like A Testament, where the last will
 is that which taketh place.

To these differences may be perhaps added, that,
 whereby some Eggs are strong, negst, and (if wee
 may so say) *couragious*; for as there is a soule in
 Eggs, so have they likewise a competent vertue.
 For as in other sorts of Animals, some Females are
 so libidinous and full of *venery*, that they take
 like *Tinder*, from one single act of Coition (be it
 never so feeble, and the male never so impotent) and
 conceive forthwith, and bring diverse *fatufes* by
 that one act: others again are so dull and *staggish*,
 that unless they be provided with a more gene-
 rous male, and him also highly inflamed (and the
 coition likewise repeated and continued) they will
 remain unsuccessfull. The same also befallerh in
 Eggs, whereof some, though conceived by coition,
 are *improlifical*, unless they be impowered by re-
 peated, and continued coition.

Hence it cometh to pass, that some egges are
 quickly altered, and after three dayes of *Incuba-*
tion discover some rudiments of a *fetus*: but o-
 thers are either easily corrupted, or are slow in
 their progress towards *chickens*, and yield no ex-
 pectation of a *chicken*, even at the seventh day: As
 shall be hereafter proved, in the discourse of the Ge-
 neration of the *Pulvis*, or *Chicken* out of the *Egge*.

And thus farre of the *Womb* of the *Hen*, and its
 Office: as also of the Generation of the *Hen-egge*, its
 differences,

differences, and accidents : wherein we have delivered what we have experimented our selves ; which you may give judgement of other Oviparous creatures.

It now remaineth that we should prosecute the history, of the *Generation, and Formation of the Fœtus out of the Egge.* For (as I informed you before) the whole *Contemplation of the brood of Hens and Cocks* is comprehended in these two things : namely, how the *Egge* is produced of the *Henne and Coske*, and how the *Cock and Henne* are framed out of an *Egge* : and by this circle the propagation of their *Race* may by the benefit and favour of *Nature*, be prolonged, and continued.

*Of the generation of the Fœtus
out of a Hen-egge.*

EXERCIT. XIV.

WEe have already discovered the *Formation, and Generation of the Egge* ; it remains that we now deliver our *Observations*, concerning the *Procreation of the Chicken out of the Egge.* An undertaking equally difficult, usefull, and pleasant as the former. For *Natures Rudiments and Attempts* are involved in obscurity and deep night, and so perplext with *subtillties*, that they delude the most piercing wit, as well as the sharpest eye.

Nor can we easier discover the secret recesses, and dark principles of *Generation*, then the method of the *fabrick and Composure of the whole*

world. In this reciprocal interchange of Generation and Corruption consists the *Æternity* and Duration of mortal creatures. And as the Rising and Setting of the Sun, doth by continued revolutions complete and perfect Time: so doth the alternate vicissitude of Individuums, by a constant repetition of the same species, perpetuate the continuance of lasting things.

Those Authors which have delivered any thing touching this subject, do for the most part tread a several Path: for having their Judgements prepossessed with their own private opinions, they proceed to erect and fashion principles proportionable to them.

Aristotle of old, and Hieronymus Fabricius of late, *Hist. an. l. 6. c. 3.* have written so accurately concerning the Formation and Generation of the Fetus out of the Egge, that they seem to have left little to the industry of Posterity. And yet Ulysses Aldrovandus hath undertaken the description of the Pullulation or formation of the Chicken out of the Egge, out of his own Observations: wherein he seems rather to have directed and guided his thoughts by the Authority of Aristotle, then his own Experience. *Ornithol. l. 14.*

For Volcherus Coiter, living at Bononia at the same time, did by the advice of the said Aldrovandus (whom he calls Tutor) dayly employ himself in the opening of Egges then sat upon by the Hen, and hath discovered many things truer then Aldrovandus himself, of which he also could not be ignorant. *Nobil. exer. l. 6.* Likewise Æmilius Parisanus (a Venetian Doctor) despising other mens opinions, hath fancied A new procreation of the Chicken out of the Egge.

But because somethings, (according to our experience) and those of great moment and consequence,

quence, are much otherwise, then hath been yet
 delivered, I shall declare to you what dayly pro-
 gress is made in the egge, and what parts are altered,
 especially about the *first dayes of Incubation*,
 at which time all things are most intricate, con-
 fused, and hard to observe, and about which *Authors*
 do chiefly sticke for their own observation,
 which they accommodate rather to their own pre-
 conceived perswasions (which they have entertained
 concerning the *Material* and *Efficient causes* of the
generation of Animals) then to truth her self.

What *Aristotle* relates concerning the *Procre-
 tion* of the *Chicken*, is most true in it selfe; yet like
 one who had not experimented the matters him-
 self, but had received them from other experi-
 enced persons, he doth not rightly distinguish them
 by their proper times: and is very much mistaken
 concerning the place in which the *first principle* of
 the *Chicken* is cast, which he decrees to be in the
Acute Angle of the *Egge*, and is therefore justly re-
 prehended by *Fabricius*. Nor doth he seem to have
 observed the beginning of the *Pullus* in the egge, or
 to have been able to have found those things
 there, which he accounts necessary to every *Gene-
 ration*. For he would have the *White* (because no-
 thing can possibly be made of nothings, according
 to the natural course) to be the *Matter* constituting
 the *Chicken*. Nor did hee sufficiently apprehend
 how the *Efficient cause* (namely the *Cocks seed*) can
 act without a contact; or how the *Egge* could de-
 scend down accord, without any inherent geniture
 of the *Male*, ingender the *Fœtus*.

Aldrovandus, partaking of the same error with
Aristotle, saith moreover, (which none but a blind
 man can subscribe to) that the *Yolk* doth in the *first
 dayes*, arise to the *Acute Angle* of the *Egge*: and

shinks

thinks the *Grandines* to be the *Seed* of the *Cock*; and that the *Pullus* is framed out of them, but now is shewed as well by the *Yolk* as the *White*: which is clean contrary to *Aristotles* opinion, who conceived the *Grandines* to conduce nothing to the fecundity of the *EGGE*.

Volcherus Coiter delivers truer things, and more consonant to *Autopsie*, yet his three *Globuli* are meer fables. Nor did he rightly consider the principle, from whence the *Fetus* is derived in the *EGGE*.

Hieronymus Fabricius indeed contends, that the *Grandines* are not the *Seed* of the *Cock*: and yet he will have the body of the *Chicken* to be framed out of them. (as out of its first matter) being made fruitfull by the *Seed* of the *Cock*. He likewise saw the Original of the *Chicken* in the *EGGE*; namely the *Macula*, or *Cicatricula* annexed to the membrane of the *Yolk*, but conceived it to be onely a *Relique* of the *Yolk* broken off, and an infirmity or blemish onely of the *EGGE*, and not a *Principle* part of it.

Perisæus hath plentifully confuted *Fabricius* his opinion concerning the *Chalaze* or *Grandines*, and yet himself is evidently at a loss in some certaine circles and points of the *Principle* parts of the *Fetus* (namely the *Liver* and the *Heart*;) and seems to have observed a *Principium*, or first *Principle* of the *Fetus*, but not to have known which it was, in that he saith, That the *Punctum Album* in the Middle of the *Circles* is the *Cocks Seed*, out of which the *Chicken* is made.

So that it comes to pass, that while each of them desire to reduce the manner of the *Formation* of the *Chicken* out of the *EGGE*, to their own pre-conceived opinions, they are all wide from the mark.

For some conceive the *Seed* and *Blood* to be the Matter which doth constitute the *Chicken*: Others conceive

conceive the *Seed* to be the *Efficient* and producing *cause*, or *Artificer* that builds the *fabrick* of it: which yet upon deliberate consideration it appears most infallible, that there is *no matter at hand at all*, nor *no menstruous blood*, which the *Seed* of the *Male* can fall to work upon, or coagulate: (as *Aristotle* would have it) *nor is the Fœtus made of the Seed of Male or Female, or any commixture of them both.*

The first Inspection of the Egge, or what the first day of Incubation doth produce in the Egge.

EXERCIT. XV.

THAT we may the better discover what the first day of incubation hath produced in the Egge, we must first know what alterations will befall on eggs of their own accord; by which a stale egg is distinguished from a fresh, (without any consideration of the *Hens* sitting at all) that so it may appear, what is wrought by the very incubation in it selfe. There is therefore (as we have declared before) in all eggs, a certain cavity or hollow in the blunt end of the egge; which cavity as the egg groweth fialer, increaseth accordingly; especially in hot Countries and seasons (by reason of the exhalation of a thinner part of the white:) we have ipoken in the *History* of the egge. While that cavity doth exspatiate, it enlarges according to the *longitude*, then *latitude* of the *Egge*.

ducin^g *egge*, and obtaineth a *figure* at last, which doth re-
when it is from being *orbicular*.

The *Egg-shell* being now less transparent, grow-
all, much cloudy.

The *White* groweth thicker, and more viscom,
standing towards a *duskey* or *Straw-colour*.

The Proper *membrane* or coat of the *Yolke* be-
cometh more remiss and loose, shrinking up into
wrinkles.

The *Chalazæ* continue still the same place, site,
and consistence, at each end of the *egge* (and that
not in *new-layed egges* onely, but *stale* ones; nor
in those alone that are conceived after *coition*, but
in *wind-eggs* also;) by whose firme connexion, the
Yolk and *White* are so fast cemented together, that
both retain their proper position. For these are two
instruments mutually opposed, or the *Piles* and
hinges of this *Microcosme*: so composed, as if they
were onely a conflux of the numerous coats of the
White, and were wound as it were into a knotty
cord, at both ends where they respect the *yolk*. And
thence it cometh to pass, that the *yolk* is not easily
separated from the company of the *White*, except the
egg-chalazæ be first divided: which done, they pre-
sently dis-join. And by the assistance of these hin-
gles, the *yolk* is both fixed in the center, and preser-
ved in its right consistence. So that the chief part
of all, namely the *Cicatricula*, retaineth still the
same region or altitude in the *Egge*, and continueth
in a middle space from both the extremities. For
this *Spot*, or *Cicatrice*, as well in a *stale*, as *new-laid*
egge, is still found in the same consistence; magni-
tude, colour, and site. But so soon as ever the *egge*
beginneth to *Pullulation*, be it either from the *Incuba-
tion* of the *Hen*, or the accession of any other fo-
reign heat whatsoever, this *Spot* is presently di-
lated,

lated, and widened like the *Ball* of the eye : and from it (as from the choicest center of the egg) the secret plastick faculty doth issue out, and germinate. And yet this first Principle of the egge was never yet (to my knowledge) observed by any man.

Now, at the *second day* of Incubation, when the Egge hath grown warm four and twenty houres under the *Hen*, as its cavity which is in the obtuse angle is much amplified, and fallen lower ; so also doth the interiour constitution of the egge vary and change. For the *Yolk* which before stuck fast in the center of the *White*, ariseth towards the blunt angle ; and the middle part of it, where the *Spot* is ingrafted, is elevated, and applyeth it self to the membrane which encompasseth the cavity, so that now the *Yolk* seemeth to be annexed to the cavity by the *Cicatrice*. And as much as the *Yolk* riseth upward, so much is the grosser part of the *White* depressed towards the acute or lower angle. Whence it appeareth (as *Fabricius* rightly noted) that either *Aristotle* was in an error, or else that there is a fault in the impresson, where it is said, about that time (namely, within three dayes and many nights) the yellow humour is lifted to the top there where the eggs beginning is, and where the egg is naked there about (namely, at the dilated cavity.

Hist. an. l.
6. c. 3.

Ibid. l. 3.
c. 2.

For *Aristotle* calleth that the beginning where the Acute Angle is, which parteth last from the *Hen*. But notwithstanding all this, it is an undoubted truth, that the *Yolk* ariseth towards the Blunt angle of the egge, and that the cavity is there dilated. And so questionless *Aldrovandus* is deceived, who (though he speak as if he had experimented the matter) saith, that the *Yolk* riseth to the Acute angle. I confesse, I have sometimes seen, about the

second

second and third day, the *Cicatricula* dilated, and a foundation laid towards the formation of the *Fetus*, when the *yolk* as yet was not ascended. But this is very rare, and I conceived it to happen so, by reason of the imbecillity, and infirmity of the *Egge*.

On the second day of Incubation, or first of Inspection, the fore-said *Spot* is dilated to the magnitude of a *Pease*, or *Lentil*, and is divided into circles, (as if they were drawn by a pair of Compasses) which have a very small white *Point* for their Center. It is very probable, that *Aldrovandus* also did observe this *Macula*, or *Spot*; for he saith, In the midst of the *yolk* there appeared some kinde of whitish thing. So did *Coiterus*, where he saith, The second day, there remained in the middle of the *yolke* a whiter part. And *Parisanus* also, who saith, The second day, I saw a white substance about the bigness of an indifferent faire *Lentile*, and of that figure: and this (saith he) is the *Cocks* semen, enwrapped in a white and most slender coat, lying under the two common membranes of the *egge*, but above the proper containing coat of the *yolke*. And yet I conceive, that no man hitherto hath acknowledged, that this *Cicatricula* was to be found in every *egge*, nor that it was the first Principle of the *Egge*.

In the meane while the *Chalazæ* or seed-pearls, do decline on each side from the two ends of the *egge*, towards the sides: and this proceedeth from the shifted scituation of the *White* and *Yolk*. So that one of the *Chalazæ* descendeth something from the obtuse angle, and the other ascendeth proportionably, from the *Acute*; as in an *Oblique Sphere*, by how much one *Pole* is elevated above the *Horizon*, by so much is the other depressed under it.

And now the Yolk (especially about that part where the *Cicatricula* resideth) doth begin to dissolve and melt a litle, and the proper coat thereof (which in staler egges is remiss, slack, and wrinkled) groweth smooth and full; the Yolk it self also seemeth to have regained the same colour, consistence, and inoffensive taste, which it formerly had, when the egge was new.

And this is the first dayes Progress of the Egge, towards a Chicken, and the first platform of its approach. But *Aldrovandus* addeth, that there is as yet no alteration at all in the White; wherein hee saith right. But where he affirmeth, that the Semen of the Cock is perceived in the Yolk, he is apparently in the wrong. His Argument by which he would maintain the *Chalazæ* to be *Semen Galli*, is exceeding slender, and that is, because egges which are destitute of these *Chalazæ*, are not fruitfull. Hee is much in the right; for indeed they are not Eggs without them. For in all eggs, be they fertile, or not fertile, these *Chalazæ* are inseparable In-mates. But perhaps the Good-wives deceived him (which call these *Chalazæ*, *Galladura*, in Italian) and so betrayed him into the common Heresie. Nor is *Hieronymus Fabricius* less guilty of Imprudence, who offereth to our view the formation of the *Pullus*, graven in several Tables; contending, that it is bodyed, and constituted out of these *Chalazæ*; not so much as taking notice, that the *Chalazæ* are all this while both of them entire, and unaltered (having onely removed their stations) and that the *Exordium* of the Chicken is to be sought a good distance from the *Chalazæ*.

The second Inspection of the Egge.

EXERCIT. XVI.

WHen two dayes are now passed, the afore-
 said *circles* of the *Cicatricula* are more am-
 ple, and conspicuous, being of the breadth of the
Ring-finger, and sometimes of the *Middle*; where-
 in the whole *Macula* or *Spot* is divided into two
 (and sometimes into three) *Regions*, and those
 oftentimes inammelled, and obscurely shadowed
 with several colours; fully representing the figure
 of an *Eye*, and that not only by reason of its pro-
 tuberance, like that in the *Tunica Cornea*, or horny
membrane, or coat of the *Eye*; but magnitude al-
 so, and likewise of that most transparent, most lu-
 cid humour contained in it: whose *Center* repre-
 senteth the *Pupilla*, or sight of the eye; but having
 a white point fixed in the center, it resembleth the
 eye of some small *Bird*, where the middle of the
Papilla is blemished and disfigured by some suffu-
 sion, or *Cataract*: (as they call it) and from this
 Resemblance we call it *Oculum Ovi*, the *Eye* of the
Egge. Between these *Circles* is contained a most
 bright refulgent liquor, clearer then any *Crystal-*
line humorr in the world; which if you look upon
 against the light, the whole *Macula* will now ra-
 ther appear in the *White* of the *Egge*, then rivited
 into the *membrane* of the *Yolke* (as formerly it did)
 and (like some part or portion of the *White*, dis-
 solved, and clarified) contained and bounded
 within a most slender coat belonging to it self. And
 this is the reason why I call this Liquor, *Oculum*,
 the *Eye*, or *Colliquamentum Candidum*, the white
 dissolved

dissolved substance ; as if it were some portion of the *white* of the *Egge*, melted and liquefied by the heat shining in its own *sphere* apart, (unless it be scattered and distracted by concussion) and seemeth like a more refined, and more concocted, spirituous part, distinguished from the courser *White* by a peculiar inclosure of its own, and seated and enthroned in the midst, between both *Yolk* and *White*. It as much surpasseth the rest of the *White* in clearness, and transparence, as the most *Crystal Spring* excelleth the troubled *Lake*. The *Coat* encircling this humor, is so nice and fraile, that (if you be not exceeding circumspect) it will soon be rent, and so disparage the purity of this, with the confusion of other *liquors*.

And here my thoughts were a long time strangely divided, what I should resolve concerning this *Candidum colliquamentum* ; whether I should name it the *Calidum Innatum*, or *Humidum Radicale*, the *Radical Heat*, or *Moysture*, or the prepared matter from which the future *fetus* was to take its rise : or the *Aliment* exactly concocted, such as the *Ros* is reputed to be amongst the *secundary humours* ? For I was fully satisfied (as I shall declare hereafter) that in the midst of this the first rudiments of the *Fetus* lay, and that this also was its nourishment, and after it was of some growth, the place of its abode.

Hence it appeareth, that this *Colliquamentum* is soon enlarged, (namely in the compass of a day) as is evidently deciphered in *Fabricius* his second Figure, especially the inward *Region* of it ; which, while it dilateth it self, it obliterated and quite expungeth the outward. As you may observe in the *Eyes* of those creatures whose sight of the *Eye* is very large, and therefore they see better in the

Night then in the Day (of which kinde are Owles, Cats, and the like; whose Sight is most dilated in the dark, but more contracted in the Light :) for if you transerre such a creature nimbly from the light into the shade, you shall perceive plainly how the the sight is distended, so that it will much diminish the other circle, (which is called the *I-ru*) and almost quite over-run it.

Parisanus lighting upon these circles, was much mistaken; for he mustereth up amongst his circles, a white one, a yellow one, one of the complexion of honey, and another white one besides; asserting the fetus to be made of the middle white point (which doth indeed really appeare in the midst of those circles) which he fancieth to be the *Semen Galli*. And that he may approve himself more cunning and subtile yet, Before (saith he) there appeareth any blushing or redness in the body of the Fœtus, there are in it as it were two exceeding small Bullulæ or Bubbles; neither of which hath any ruddiness at all at the first: and one of these Bullulæ he would obtrude upon us for the Heart, and the other for the Liver. But the truth is, that no such Bullula is to be seen at all, before a sanguine ruddiness doth appear; Nor doth the Fœtus look red at all at first; Nor do any of those Bullulæ give us any representation at all of a Liver, but both of them expresse the two Ventricles of the Heart, and by leaping (as shall be explained hereafter) do make mutual returns to one another by their *Systole* and *Diastole*.

Aristotle seemeth to have understood this colligamentum, where he saith, About that time (namely the third day) there is a certain membrane divaricated with certain sanguineous fibers, which contain a white liquor, arising from the spriggs of those veines. For by white liquor, he could not mean the whole

white of the egge ; because the coat of the white is not then sprinckled with veins, but onely the coat of this *colliquamentum*. And therefore he saith, *There is a membrane also*, intimating a distinct membrane from those of the Yolk and White, in that he saith it ariseth from the spriggs of the veines, about the third day. Coiterus also seemeth to have acknowledged this *colliquamentum*, saying, Some part of the White approacheth neerer to whiteness then the other, and some to density. Now the aforesaid *colliquamentum* is encompassed with its proper coat, and is distinct and separate from the rest of the White, before any part at all of the blood appear.

We shall have occasion to discourse hereafter of the mighty use of this *colliquamentum*, in relation to the *fatus* of all kinde of Animals. For while they swim there, they are guarded, and skreened from all *concussion*, *contusion*, and other outward injuries, and are also nourished by it.

I saw long since a *fatus* of the magnitude of a Pease-cod, cut out of the *Uterus* of a Doe, which was complete in all its members (so that it was apparently a Male by the parts :) I shewed this pretty Spectacle and Rarity of Nature to our late King, and Queen. It did swim, trim and perfect, in such a kinde of White, most transparent, and crystalline moysture (as if it had been treasured up in some most clear glasse receptacle) about the bigness of a Pigeons egge, and was invested with its proper coat.

The third Inspection of the Egge.

EXERCIT. XVII.

WE have seen the second *Progress*, or preparation of the *Egge* towards the *Fœtus*, which falleth within the *third dayes Observation*. It followeth that we now attend the *third Appearance*; which presenteth it selfe to our view after three daies and as many nights.

And of this *Aristotle*: *There doe begin to appear* *Hist. 7.11*
some indications of Generation in Hennes, after three *6.c.3.*
dayes, and so many nights; (as suppose upon *Munday morning*, in case that on the precedent *Fryday-morning* the *Eggs* were layed under the *Hen*, then ready to sit) and the declaration of this *Inspection*, is the purpose of *Fabricius* his third *Figure*.

If therefore you observe on the *fourth day*, you will meet a great *Metamorphosis*, and wonderfull alteration; which are more evident, for almost every hour all that day long: about which time the *Egg* beginneth to step from the life of a *Plant*, to the life of an *Animal*. For now the *Limbus* or *bemne* of the *colliquamentum* beginneth to blush and purple, being encompassed with a slender bloody line: and in the center almost of it, there leapeth a *capering bloody point*, which is yet so exceeding small, that in its *Diastole*, or *Dilatation*, it flasheth onely like the most obscure and almost indiscernable spark of fire; and presently upon its *Systole* or *Contraction*, it is too subtile for the eye, and quite disappeareth. So slender are the first *Rudiments* of *Creatures* lives; which the *Plastical faculty*

culty sets on foot by so undiscoverable beginnings.

If you are desirous to make discovery of this observation toward the declining of the third day, you may if you be extreamly intent, by the assistance of a clear & great light, or by the Sun beams, or a *Perspective*, make a shift to discern it. For else, this purple streak is so exceeding nice, and fine, and the motion of the *Punctum saliens* is so imperceptible, that you will only loose your labour. But, at the beginning of the fourth day it is evident, and at the end thereof, most notoriously visible, that the *Punctum sanguineum saliens* hath now *Animal motion* (saith *Aristotle*) in the candid liquor: (which I call *colliquamentum*.) And from that (Point) two hollow threads like *veines*, full of blood, are carried crooked to the purple Line, and the coat encompassing the *colliquamentum*: scattering as they pass along many *fibrous* branches through the whole space and continent of the *colliquamentum*, all which spring from the same *Original* (as the boughs of *Trees* from the same *Trunke*.) In the crooked Angle of this *Root*, and the Middle of the *colliquamentum*, the *Punctum Rubrum Saliens* is enthroned, which keeps time and *decorum* in its pulsation, compounded of a *Systole*, and *Diastole*. In the *Diastole*, as if it did imbibe a larger proportion of blood, it dilates it self, and leaps; but connives in the *Systole*, as if it suffered a convulsion by the stroke, and resigned the blood again.

Fabricius hath described this *Punctum* or Point, in his third *Figure*, and, (which is strange) took it for the body of the *Fetus*; as if either he had not observed its leaping, and pulsation, or else had not understood that text of *Aristotle*, or at best had forgotten it. But that which is yet more strange, is, that

that he should be nothing mindfull all this while of his *chalaza*, from which himself deduces the rudiments of the chicken.

Ulysses Aldrovandus, a Writer in *Bononia*, about *Ornitbol.* that time saith, There appeared in the White a little ^{l. 14. pag.} kinde of *Punctum saliens*, or capering Point, which ^{217.} is the same which *Aristotle* decrees to be the Heart. Out of which I plainly discovered a little Trunke of a vein to arise, and two other little branches tending towards this, which were those very channels of blood, which he had wrote to be sent forth to the two coats encompassing the Yolk and White. Now I am clear of his Opinion, conceiving those passages to be Veins, and to have a pulsation, containing a purer blood in them, and such as is usefull and proper for the generation of the more principle parts; namely, the Liver, and the Lungs, and the like. But both these are not veines, nor have they both a pulsation; for one is an Arterie, the other a vein, as wee shall hereafter shew: where we shall also declare, that these Meatus do become the Umbilical vessels of the Fetus.

Volcherus Coiter hath these words: The little bloody Point, or Globulus found before in the yolke, is now rather in the whine, and evidently pulsatile. Now he is out, in saying, It was found before in the yolke; for that Point which was in the yolke was white; and did not leap neither; nor doth the bloody point or Globulus appear to leap the second day after Incubation. But that Point (which we have declared to be placed in the Middle of the round, as if it were the center, and which is annexed to the yolke) doth vanish quite away, before the Point, which *Aristotle* calleth *Punctum saliens*, can be discerned at all, or (as I believe) becometh red, and leaping. For both these Points are seated in the center of the *colliquamentum*, and neer the root and original

original of the *veines* which spring from thence but they are never seen together, but the *Red* which is the *Punctum saliens*, succeeds in the place of the *White* one.

In this indeed *Volcherus* is in the right, where he saith, *The Punctus saliens is now rather found in the White, then in the Yolke.* By which words, I was incited to make diligent search, whether the *Punctus albus* be transmuted into the *Punctum sanguineum*; because both of them are almost of the same magnitude, and did seem situate in the same place. And sometimes, I found, the glistening purple circle which is the outermost, ending about the *vermilion horizon*, encompassed by the *Colliquamentum*; in whose center there was the *Punctus albus*, but not the *Ruber*, or *Saliens*: but I never saw those two *Points* together. This disquisition is of great moment; namely, Whether there be blood before *Pulsation*, and, Whether the *Punctus* arise from the *Veines*, or the *Veines* from the *Punctus*?

According to my observation the *Blood* seems to be before the *Pulse*; and I therefore believe it, because, Upon *Wednesday* about the *Evening*, I put three egges under the *Henne*, and upon *Saturday*, a little before the same time, I found these egges cold, as being forsaken by the *Henne*; however, opening one of them, I found the rudiments of a *Chicken*, namely the *Purple* and *bloody Line* in the circle: but in the center, instead of the *Punctum saliens*, I found the *Punctum album*, which is bloodless. By which I perceived the *Henne* had not long deserted her charge: whereupon, seizing upon her by force, I penned her up all night, having first layed the two former remaining egges, with other that were not there before, into the *Nest*. Now for the success: The next morning betimes, my two egges

were well recovered; and I found in the center the *Punctum Micans*, which was much less then the *Punctum Album*; out of which (namely the *Punctum Album*) a spark or lightning, darting as it were from a cloud, appeared in the *Diastole* onely. So that to my Apprehension, the *Punctum Rubrum* did leap out of the *Punctum Album*, at least that *Punctum* is generated in the *Punctum Album*, and *Blood* being now there, hath its Birth, or at least its Motion there. Nay, I have many times observed, The *Punctum saliens*, when (as quite expired) it lay deprived of all motion, it hath regained fresh motion and pulsation, by a new heat and cherishing. Therefore in order of Generation, I conceive that the *Punctum* and *Blood* do first exist, but the pulsation arriveth not till afterward.

And this is most certain, that nothing at this time appears, besides the bloody streaks, the *Punctum saliens*, and those Veins which are all derived from one Trunk (as that Trunk it self from the *Punctum saliens*) and do afterward constitute the *Umbilical Vessels*: which being disseminated farre and wide, the *fetus* at length (according to it growth) doth attract sustenance from the *Yolk* and *White*. You may see a lively resemblance of these *Veins* & their propagations in the leaves of *Trees*, whose fibres do all proceed from the *pedunculus* or stalk, and are diffused from one Trunk through the whole capacity of the *Leaf*.

This whole entire *Colliquamentum*, distinguished and sprinkled with bloody fibres, representeth the form & magnitude of the two wings of a *Butterflie*. And it is no other then that *Membrane* which *Aristotle* speaks of, where he saith, The *Membrane* divaricated with bloody fibres, containeth then a white liquor, springing from those *Meatus* of the *Veins*.

In loc. supra
dis.

And

About the end of the fourth, and beginning of the fifth day, being now enlarged, it seemeth to be changed into a small thin bladder, containing blood in it ; which it ejects at every contraction, and recalls again at every diastole.

Hitherto I could not discover any distinction of Vessels : for the Arteries do not yet differ from veins, either in coat, or Pulsation : and therefore I call the vessels indifferently veins, or with Aristotle, Meatus Venales, Veinal Passages, or Channels.

This *Punctum* (saith Aristotle) now bestirres itself like an Animal ; for Motion and Sense distinguish an Animal from a non Animal. Since therefore this *Punctum* begins now first to move, we may justly say it hath put on the nature of an Animal : and that the Egge which was before endued with a vegetative soule, is now over and above that, furnished with a Motive and sensitive power ; and is raised from a Plant to an Animal ; and that at the same time the soule of the Fetus is gone in, which first formes the chicken out of the Egge, and afterward informs that chicken. For Aristotle demonstratively resolves of the Faculties, by the Operations ; and from them also concludes of the cause and fountain of Life (namely the Soul) and that to be in, actually, (where the Operations actually are.)

Lib. de Anima.

And I am confirmed by many proofs and experiments, that not motion onely is now the companion of the *Punctum saliens*, but also Sense it self. For upon every touch, be it never so gentle, it is variously provoked, and disturbed, (at the same rate as sensitive bodies proclaime their distastes by particular motions) and so offended with repeated injuries, that they did confound the chime and

order

Ex. XVII. *The third inspection of the Egge.*

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order of its pulses. So in the *Plant*, called the *sensitive Plant*, and other *Zoophyta*, we conclude there is *sense*; because upon touch they contract themselves, and take it unkindly.

I have, I say, often seen, and so have many more who have been present, this *Punctum*, upon contaction by a *needle*, *probe*, or the finger it self, nay upon the admission of a more searching *heat* or *cold*, or any other thing that could molest, and disorder, declare many *symptoms* of its *resentment*; for it would flie into many *permutations* of *pulse*, beating much stronger, and nimble then before. So that, no question, this *Punctum* doth (as an *Animal*) *Live*, *Move*, and *Perceive*.

Moreover, expose an *egge* too long to the *colder airo*, and the *Punctum saliens* beats slower, and hath a languishing *motion*; but lay your finger warm upon it, or cherish it kindly any other way, and it presently gaineth *strength* and *vigour*. And after this *Punctum* hath declined by degrees, and being full of *blood* hath ceased from all *motion*, exhibiting no *specimen* of *life* at all, and was given up for lost, and dead, upon laying of my finger warm upon it, for the space of only *twenty pulses*, the poor heart hath awaked, and recovered again, and as it were rescued from the grave, proceeds to its former *harmony* afresh. And this hath been done again and again by me, and others, by any other reviving heat, were it of the *Fire*, or warm *Water*: as if it were in our dispose to condemn the little *Soule* to the *Shades*, or reprove it to *life*, at pleasure.

What we have here delivered, doth for the most part come to pass the *fourth day* from the *first Incubation*, or at the *Third Inspection*. I say, for the most part; for it falls not out perpetually so, because there

there is a great diversity in the maturity of *Egges*, and some come to *perfection* sooner then their fellows. As is usually in the fruits of any Tree, whereof some are ripe, and ready to fall of themselves: whilst others are crude and greener, and cannot be shaken from the Boughs. So that some *Egges* are lesse forward the *fifth day*, then others the *third*. And (that I may instance in what I have found and tryed) I have found this true in very many *egges*, whom the *Hen* hath fostered the same length of time, and I have opened them all the same day. So that I have had no cause to quarrel against the weaker *Sex*, the distemper of the *Aire*, the neglect of the *Henne*, or any other Accident; but onely the innate weaknesse of the *Egge*; and the penury of the *ingenit Heat*.

Ova Hyphenemia, or *Addle Egges*, do at this time (as in a critical day) begin to alter and discover their *genius*: For as fruitful *Egges*, by the innate *plastick* vertue do alter and resolve into a *Colliquamentum* (which doth after shift into bloud) so *Subventaneous Eggs*, at the same time, begin to corrupt, and putrifie. And yet I have sometimes observed the *Macula* or *Cicatricula* to be distended wider even in *barren egges*; but it never rose up to the *top*, nor was ever circumscribed by the *circles* orderly drawn about it. I have also sometimes seen the *Yolk* grow clear, and liquifie, and the parts congealed, as it were, by rash, inconsiderate *coagulation*, float up and down like scattered clouds. And though these *Egges* cannot yet be called *corrupt*, *putrid*, and *unsavory*; yet they are very much prepared towards *putrefaction*, and do compleatly arrive thither, by the continuation of the warmth of the *Sitting-Henne*, and set out their *progresse* towards *corruption*, from the very

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very place and stage, whence *prolificall Eggs* advance to *Generation*.

The *Perfester* sort of *Egges* therefore do now about the declension of the *fourth day*, acquire a twofold, or bipartite *Vesicula pulsans*, or vesicle of *pulsation*, one making answer and replies to the other by a double *pulsation*, in that Order and Method, that whilest one is contracted, the other shines and swells with *blood*; which presently being contracted, dischargeth it self of the *blood* that was in it; and in a moments time intervening, the former swells and returns the *Pulse*, so that you may evidently see, that the action of these *vesicles* is *Contraction*; by which the *Blood* is driven, and pumped into the *vessels*.

The *fourth day*, (saith *Aldrovandus*) the two *Puncta* were discovered, and each of them did move: pag. 217.
which two points were without doubt the *Heart* and the *Liver*; which *Viscera* *Aristotle* saith are seen in the *Egges* after three days *Incubation*.

But *Aristotle* never said so, nor are those *viscera* usually to be seen before the *tenth day*. And I wonder *Aldrovandus* could think one of these *Puncta Pulsantia* was the *Liver*: as if the *Liver* ever had any such motion.

It is safer to believe that one of the *Puncta salientia* (when the *Fetus* enlargeth) doth constitute the *Auricula* or deaf Ears, and the other the *Ventriculi*, or *Ventricles* of the *Heart*. For in grown bodies, the *Ventricles* of the *Heart* are after this manner filled, and supplied by the *Auricula*, which by their *Systole*, are depleted and emptied againe: as we have observed in our *Tract, de Motu cordis & Sanguinis*. In better grown *egges*, sometimes about the declining of the *fourth day*, I know not what cloudy substance did obscure these *Vesicula*

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Pulsantes, and did (like an interposed shade) obstruct my *Inspection*, that I could not so clearly discern the *Puncta salientia*. Yet by the help of a clearer light, and with a *Perspective*, and conferring with my *observations* for the subsequent days: it appeared to be the *Rudiment* of the *fetus*, or a *Cloud* exhaled from the *Colliquamentum*, or an *Effluvium* congealing about the *beginning* of the *veines*: as shall more at large be treated of in the *fifth days* observation.

Aldrovandus also seems to have observed it: The *fifth day*, (saith he) that *Punctum* which we called the *Heart*, did no longer appear to move outwardly, but seemed rather to be covered, and concealed; and the two *Meatus Venosi* were seen more conspicuous, but one larger then the other. But the Learned *Aldrovandus* is deceived, for this *Tutelard* deity taketh possession, and locks himself up in most reserved and secret recesses (when the habitation is almost compleatly erected) a long time after. And he likewise mistakes, where he saith, that by the innate vertue of the *veins*, the remaining portion of the white is turned into a kind of straw-coloured substance. For that complexion is in the thicker white, of all egges that are stale, and is daily increased in them, (namely, according as the *Egge* groweth *Staler*, as is said) and that without any assistance of *veins*, by reason of the thinner substance exhaling.

But the *Fetus* growing bigger, (as we shall declare in its place) and the *circles* of the branches of the *veins* being disseminated up and down, part of both the *juyces* are dissolved, not (as *Aldrovandus* would have it) by an innate vertue of the *veins*, but by the heat of the *blood* inhabiting there. For into what part soever of the moisture

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the foresaid *veins* extend their Territories, there presently appears a *colligation* or resolution in the bordering parts; and therefore the *Tolk* at that time seems double, because its superior part (which is joined to the cavity above, about the *obtuse angle*) being more mollified, and dissolved then the rest of the *Tolk*, appears like melted *Wax*, compared to the other cold, compacted part. And upon that score (as all melted things do) it obtaineth a larger roome. And that *Upper part*, liquified by the genital warmth is disterninated from the other liquors (and especially from the *White*) by a peculiar most thin coat of its own. Whence it happens, that a breach being made upon this slender, frail, and invisible *membrane*, there presently follows a *confusion* and mixture of the *Tolk* and *White*, which disturbs the whole frame. And it is many times a cause to frustrate and void *Generation* (when those liquors become to be of a diverse, nay of a contrary nature) according to that Text in *Aristotle* *de gen. an.* so often cited. Egges are depraved and made *Lib. 3. c. 2.* idle most in hot weather, and that upon good reason. For as *Wines* grow sower in hotter weather, the dregs being subverted (for that is the cause of their depravation) so Egges are destroyed, their *Tolk* being corrupted: for these are the more terrene and earthy parts in both. So that *Wine* is disturbed by a commixture of the dregs, and the Egges by diffusion of the *Tolk*. And hither you may justly reduce that of *Hist. an. l.* him too, where he saith, Egges that are under the *Heavens* in tempestuous *Wunders*, are corrupted. For the exceeding smal *membrane* is by so great a noise quickly torne asunder. And therefore perhaps, confused and putrid Egges, are called *Ova Cynosu-* *Lib. 8. c. 5.* *ra*, because (as we have observed) it thunders most in the *Dog-days*. And therefore *Columella*

rightly admonisheth, that most men deeme the Summer-Solstice to be inconvenient for hatching of chickens.

This is most certain, that Egges suffer quassation, concussion, and dissolution very easily, if any man disturb them while the Hen is Sitting, because at that time the liquors in them are liquefied, and swell, and the membranes embracing them are dilated, and grow tender.

The fourth Inspection of the Egge.

EXERCIT. XVIII.

*Hist. an. l.
6.c.3.*

THE fifth day of Incubation, is discerned for (saith Aristotle) the body of the Pullus, being very small, and white, wherein the head is conspicuous, and in it the eyes much turgent, which continue so long time, for it is long ere they abate, and conuulge. But in the lower part of the body, there is no part at first extant, correspondent to the upper. But the Branches which shoot out from the Heart, one tending to the ambient membrane, the other to the Yolk, do supply the office of the Navel. The original of the Chicken is therefore from the White, but its nourishment from the Yolk by the Navel.

By which words Aristotle seems to distribute the whole Generation of the Pullus into three classes or orders, namely from the first day of Incubation to the fifth: and thence, on to the tenth or fourteenth, and so on to the twentieth. As if he had once recorded those things in his History, which he afterwards covered at these three Inspections. The great change

Ex. XVIII. *The fourth Inspection of the Egge.*

changes in the Egge do indeed happen at these times : as if by these *Decretory days*, as by three distinct degrees, the progresse of the perfect Egge, to the utmost exclusion of the *Chicken*, were distinguished. For the *fourth day* the first particle of the *Fœtus*, namely the *Punctum saliens*, and the *Blood* appear ; and after that the *Fœtus* is corporated. The *Seventh*, the *Chicken* is distinguished into parts, and beginnes to move. The *tenth* it beginnes to be down-feathered ; about the *twentieth*, it breathes, and cries according to its kind, and seeks to make its escape. The *Life* which it obtains about the *fourth day*, seems to emulate that of *Plants*, and is to be esteemed onely a *vegetative animation*. But from that to the *tenth*, it enjoyes a *sensitive* and moving soul as *Animals* do : and after that, it is compleated by degrees, and being adorned with *Plumes*, *Bill*, *Clawes*, and other furniture, it hastens to get out, that being at length emancipated, it may be unconfined and free.

Aristotle therefore enumerates amongst those things which befall after the *fourth day*, chiefly three ; that is to say, the *fabrick* of the *body*, the *branchings* of the *veines*, which now supply the *Nature* and *Office* of the *Navel* : and the *matter* or substance whence the *Fœtus* doth first spring, and is constituted, and nourished.

Concerning the *Fabrick* of the *Body*, he relates four things, first, what *magnitude* it is of ; secondly, what *complexion* ; thirdly, what parts are most conspicuous, (namely the *Head*, and *Eyes*) and lastly, what *dijinction* or difference there is between the *Parts*. Truth is, the *Body* is exceeding small, resembling in form that common worm or Maggot, out of which the *Flie* is bred ; it is also white of colour, like that little Worm, which the

Flie depositeth in putrified flesh, to be cherished, and bred up; and he elegantly addes, *that it is most notorious from its Head and Eyes.* For that which first appears, is a similar and indistinct Body, as if it were some concrete and congealed substance of the *colliquamentum* it self (like that *Gelly* which is made of the decoction of *Harts-horn*) being like a transparent cloud, which were hardly distinguishable, were it not divided as it were into two parts; whereof the *one* lies in a heap together; and is much larger then the *other*, being the *Rudiment* of the *Head*; which is first discerned on the *fifth day*: in which the *Eyes* are anon manifestly distinguished; which at first are the biggest of all, much puffed up, and prominent, and are discriminated both from the rest of the *Head*, and the whole *Body* besides, by a certain blackness cast round about them. Any one of *these*, is larger then the whole *Head*; as also, the *Head* alone exceeds all thereof of the *Body* in magnitude. This *Whiteness* of the *Body*, endureth a while, as also, the tumor of the *Eyes*: (which are filled also with a most clear moisture or water within, but are dark and blackish without, as it is also with the *Brain*) that is to say, to the *tenth day*, and more: for (saith *Aristotle*) *It is late ere they diminish, and contract to their allotted proportion.* Nay, according to my observation, the *Eyes* of *Birds* do never reduce themselves to the *Proportion*, which is allotted as the standard between the *Eyes*, and the *Head* of a *Viviparous Animal*. For if you lay aside the *Skin*, which covereth the *Eyes* of a *Henne*, or any other *Bird*, either of them alone will soon countervail the whole *bulk* of the *Braine*: In a *Woodcock* and the like, any one of the *Eyes* is bigger then all the *Head* besides, (bating onely the *Bill*) but it is

EX. XVIII. *The fourth inspection of the Egge.*

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common to all *Birds* whatsoever to have the *Orbita*, or cavity which contains the *Eyes* to exceed the *Braine* it selfe, as you may see in their *cranium*, or *Scull*. But yet it falls out that their *Eyes* seem lesser, because they are all (except the *Sight* or *Apple* onely) shrouded with *Skin* and *Plumes*; nor are they of an *Orbicular Figure* (which might occasion their prominence or standing out) but of a *Depressed*, as *Fishes eyes* are.

In the lower part of the *Body* (saith *Aristotle*) there is no part extant at first, which is correspondent to the *Superi: r*: And so indeed it is: The *Body* at first were scarce discernable, were it not for the *Eyes* and the *Head*; so that downwards, it is not distinguished by any members at all, whether *Wings*, *Feet*, *Breast-bone*, *Rump*, or any *Viscus*: nor indeed is it graced with any *Shape* of a *Body*: but as far as I could discover, it is onely a *Little Substance*, next adjacent to the small *veine*, like the *carina* or *keele* of an imaginable small *Ship* wound up together, and like a *Maggot* or *Worme*, without any platform of *Ribbes*, *Legs*, or *Wings*: to which is fastned a little round body, which is the rudiment of the *Head*, which is more discernable th n it, and divided into three *Bubbles*, (on which fid. ioever you make your *Inspection*:) But it is indeed divided into four, whereof two are largest, and blackish, being the rudiments of the *Eyes*; the third of the *Braine*; and the fourth of the *cerebellum*, or *After-Braine*. All these are full of exceeding clear *Water*, but in the middle of the *Blackness* of the eye, is the *Apple* or *Ball* of the *Eye* (as in the *Center*) shining like a transparent *Spark* or *Crystal*. Hence I suppose, the *Tres Bulle*, the three *Bubbles* which are onely conspicuous, have imposed upon those, who have not througly observed the thing.

For having learnt, according to the old doctrine of the Schooles, that there were three *Principalities* in the *Animal Body*, and three *Principal Parts*; (namely, the *Braine*, the *Heart*, and the *Liver*) executing the chief Functions: They soon induced themselves to believe, that these *Three Bulk* were the platformes, and ground-works of these three parts. But *Coiterus*, as becomes a *skilful Anatomist*, affirms much truer, that he saw, on the *Seventh day* after *Incubation*, the *Bill*, and the *Eyes*, but could discover none of the *Viscera*.

But to *Aristotle* againe. Those *Branches*, which proceed from the *Heart*, one of them tendeth to the *circumambient membrane*, the other to the *Yolk*, supplying the office of a *Navel*. The *Fetus* being now bodied, those *veines* do execute the office of a *Navel*: and one of their *branches*, or *propagations* is disseminated into the outward coat, which embraceth the *White*; but the sprouts of the other go directly to the coat of the *Yolk*, and are disseminated through its juyce or liquor. By which it is plaine and evident, that both the *Liquors* are dedicated to the nourishment of the *Fetus*. And though *Aristotle* say, that the *Original* of the chicken is from the *White*, and its nourishment from the *Yolk* by the *Navel*: Yet he doth not say that the chicken is made of the *White*; for the *Fetus* is made of that white Liquor which we call the *colliquamentum*: and all that which we call *Oculum Ovi*, the *Eye* of the *Egge*, is contained in the *White*. Nor doth he say that the sustenance of the *Chicken* is onely from the *Yolk* by the *Navel*: but I shall interpret his words (according to my one *Observations*) thus: Though the *Pullus* assume its original in the *White*, yet it is not fed by the *White* onely, but by the *Yolk* also

EX. XVIII. *The fourth Inspection of the Egge.*

also (to which one of the *Sprigs* of the *Umbilical* *veines* doth extend) nay chiefly by the *Yolk*; for the *White* (according to *Aristotle*) is the more concocted, and purer *liquor* of the *egge*, but the *Yolk* the more *terrene*, and *solid*, and therefore more congruous to the *Chicken*, when he is growne stronger: and therefore (as shall be said hereafter) it supplies the place of *Milk*, and is that which is last consumed; for the remainder of it (after the *Chicken* is hatched, and walkes abroad with the *Henne*) it yet contained in its *Belly*.

What I have hitherto spoken, cometh to passe, from the *fourth day* to the *seventh*. But *When*, *How*, and in *what Order*, all the *Particulars* are framed, I shall now explaine.

The *Next Appearance*, which presents it selfe the *fifth day*, about the *short veine* drawn from the *Angle* (where the *two points* leaping in course are seated) there appears a *grosser*, and *whiter substance*, like a little *cloud*, (which yet is transparent) through which the foresaid *veine* doth obscurely, and as through a *cloud*, cast a glimpse of it selfe. I have seen the same sometimes, in well grown eggs; upon the *fourth day*. But this is the *Rudiment* of the *Body*, which now every hour groweth more close, and compact, and doth encompassse the foresaid *veine*, and also is annexed to it, like a little *globous body*. That *globous Rudiment* doth much exceed the *Keele* (as I may call it) of this little *Worm*, in magnitude: and it is of a *triangular figure*, that is to say, (like the small sprout of a knotted *shrubbe*) obscurely divided into *three pieces*: Whereof one is *Orbicular*, and larger then the other two, and looks black, by reason of some most slender *fibres*, which are drawn from the

the *Circumference* towards the *Center*: resembling the platform of the *Septum Ciliare*, and therefore it implies, that this particle is transformed into the Eye. In the midsts of this, is a very little *Pupilla* or *Eye-Ball*, appearing like a most bright point: (as we have said) and upon that ground I raised my conjecture, that this entire little round body, was designed for the *Rudiment* of the *Head*: and that that black circle was to be one of the *Eyes*, to which the other standeth opposite on the other side: for they are so seated, that you cannot discern them both at once, because the uppermost covereth and hideth the lower.

This first *Rudiment* of the Body, which we affirm to grow about the *veine*, (hath obtained an oblong, and something an embowed figure, (like the Keel of a Ship; it is of a *mucous* consistence, like the film or hoariness which is contracted by moist things, when they are pent up in a close place. But the small *veine* to which this hoary substance doth accrew, is the descending *Vena Cava*, passing along the *Spine* of the *Back*: as my subsequent observations have cleared. If you diligently mind the order of the pulsation of the two *vesicles*, you shall discern the blood driven by the *Systole* of that which was last contracted into the beginning of this *veine*, and this vein distended by it.

So that there are two manifest *Contractions* and *Dilatations* of the two *vesicles* which cause a motion and pulse in one another: and the preceding *Contraction* of the one, creates the *Distention* of the other: for the blood being darted into the second *vesicle*, by the *Contraction* of the cavity of the first, causeth an impletion, distention, and pulsation in it: which by and by contracting it self, disgorgeth the blood (which it now received from the former

vesicle)

vesicle) into the beginning of the foresaid *veine*, and so dilateth that. I call it yet a *vein*, though by its *pulse* I conceive it to be the *Artery*, called *Arteria*; for the *Arteries* are not yet distinguished from the *veines* by the thickness of their coats.

Having often observed these things with much caution and circumspection in several eggs, I stood a while in suspense, what opinion I should entertain of them. As, whether I should conclude this concrete, and annexed *globous body* were made of the *Colliquamentum*, (in which it swam) as out of a compacted and coagulated substance; as *Clouds* are formed out of *vapours* in the upper Region of the *Air* (which vapors were never discovered to ascend :) Or else out of some *Effluvium* or exhalation of *blood* transpiring, or some Transudation, weeping by a kinde of *diapedesis*, from the *vein*. For the first *Rudiments* even of the greatest things, are exceeding small, and is very obscure, because very litle.

This, I presume, I am assured of, viz. that the *Puncta salientia*, the Branchings of the *veins*, & the *Vena cava* it self are first existent, & that afterwards this corpulency or bulke is joyned to them. And I am also most certain, that the *Blood* is driven into this *Vein* out of the *Punctum saliens*, and that by this *Vein* that litle bulke or body is fed. For that first hoariness or *Mucus* is first of all made by an *Effluvium* of the *Vein*, (to which it grows) and from it afterward draweth its nourishment and increase: As *filme* and hoariness doth in other moist places grow between the chinks of walls, which lie long unswept; as *Camphyre* upon Cedar-planks, and *Moss* upon Stones, and *Barks of Trees*; or lastly, as a kinde of *downe* is bred upon some kinde of *Wormes*.

I did

I did also doubt at the same time, whether this Rudiment of the Head and Body had its existence so soon, as the coagulation of the *Colliquamentum*, together with the *Blood*, and *Punctum saliens* had theirs, but was then imperceptible by reason of its thinness, and clearness of substance; till congealing into a grosser film, it put on a more solid, compacted whiteness, by which it might be discerned: while yet the *Blood* which is thicker and shining might be well perceived in the *Colliquamentum* which is so diaphanous. But whilest I consider the matter more narrowly, I am fully satisfied, that the *Blood* hath a being, before any other part of the body besides, and is the elder brother to all other parts of the *fetus*; and that from it, both the matter out of which the *fetus* is constituted, as also the aliment by which it is supplied, is desumed, and is (if any thing be) the first genital particle. But how I am induced to this persuasion, shall be afterwards copiously recited, when we discourse concerning the primitive fructifying Part, the Innate Heat, and Radical Moisture; and when also we shall resolve what is to be thought concerning the soule, out of many Observations conferred together.

About this time, almost every hour, all things appear larger and clearer, and more distinct, and unfolded; and now there comes a nimble Alteration in the Egge, and many things appear one upon the neck of another. The Cavity of the Egge is now much larger, and layeth the upper part of it all void and empty, as if a fifth part of the Egge were vanished.

The litle branches of the Veins are farther spread out, and grow more numerous in their distributions, not onely into the *Colliquamentum*, (as before)

(fore) but up and down both into *Yolke* and *White*, & both those *liquors* are chequered over with *fibers*. The upper part of the *Yolke* is much dissolved and melted, as if it were a distinct thing from the inferior, and that the *yolke* were now become two; the superiour shining like *melied wax*, swelled, and bright; and the inferior and earthier, together with the duller part of the *White*, being depressed to the *acute angle*. And the proper coat of the superiour part of the *yolke* is now so thinne, that the least *concussion* breaks it; upon which ensues a *confusion* of *liquors*, and an utter *frustration* of *generation*.

And now is the first *Rudiment* of the *Fetus* to be clearly seen (as you may perceive it in *Fabricius* his *fifth* and *sixth Tables*;) which being put into a *bason* of clear *water*, will plainly discover, what *parts* of the body are already framed, and what are yet wanting and behinde. For there appears the form of a small *Worm* or *Magot*, as we see the *rudiments* of *Wormes* and *Flies* in the *boughs* of *Trees*, in the *knots* of the *Bark*, in *Fruits*, *Flowers*, and other things; but especially in *Oak apples*, in whose *center*, within a small round *Shell* or *Kernel*, is contained a clear *liquor*, which thickning and coagulating by degrees, is interlaced with most slender *fibres*, and represents the shape of a *Magot*, but continues a while immoveable, till at length endued with *sense* and *motion*, it becomes an *animal*, and departs a *Flie*.

Aristotle describes a *Generation* like this, in *Hist. an. l.* those things that are called *Sponte nascentia*. Some *S. C. 19* creatures are born of the *Dew*, which falls upon the *Leaves*. And a while after he saies: *Butterflies* are made of *Worms*, but these *Worms* of green *Leaves*; and especially of the *Leaves* of that sort of *Raphanus*, which

110 *The fourth inspection of the Egge. Ex. XVIII.*

which some call *Braslica*. They are first smaller then Millet, and afterward very litle worms; then encreasing, within three dayes they become litle *Magots*; and after this being more grown, they cease to move, and changing their form, are called *CrySTALLIDES*, being contained in a hard crust; and if you touch them, they stirre: a great while after the crust or shell is broken, and so they being become winged creatures, take their flight, and are called *Butterflies*.

de gen. an.
L3.c.9.

But we shall prove anon, that the Generation of all creatures is alike, and that all creatures, even perfect ones, are begotten of a *Worm*; which *Aristotle* also seemeth to have noted, where he saith: In all Creatures, even those which produce a perfect egge, the first conception groweth before it be distinguished: such is also the nature of the *Worm*. Now this difference there is between the generation of the *Worm*, and other Creatures; that the *Worm* growes before hee have his shape, or distinction into parts: according to that of the Philosopher, An animal is made out of a *Worm*, not as if it were made out of a part of it, or out of its Egge; but in that the whole *Worm* grows, and so becomes a dearticulate animal; namely, in growing it becomes to be jointed or distinguished.

De hist. an.
l.5.c.9.

We have indeed cause to wonder, that the Rudiments of all Creatures whatsoever, especially of Creatures that have blood, (*viz.* of a *Dog*, a *Horse*, a *Deere*, an *Oxe*, a *Henne*, a *Viper*, nay of *Man* himselfe) should so exactly resemble the shape and consistence of a *Magot*, that you can perceiv no difference at all.

Towards the end of the *Fifth day*, or the beginning of the *Sixth*, the *Head* is distinguished into three vesicles or litle bladders; whereof the first, and greatest, which is round, and blackish, is that of the *Eye*: in whose center the *Pupilla* is discovered

red

II. XIX. *The fifth inspection of the Egge.* III

like a *crystalline Point*. Under this a lesser *vesi-*
whereof part is hidden, represents the *Brain* ;
which the *third*, like a *crest* adjoyned, or a smal
round *knobb*, appears uppermost ; of which at last
the *Cerebellum* or *After-brain* is made : yet in all
these you shall finde nothing, besides a cleare wa-

And now the *Radiment* of the *Body*, (which we
call the *Keel*) doth more distinctly represent the
Spina dorsis, or *Chine* of the *Back* : to which, *sides*
begin to be built and appear ; for the *Wings* and
Legs do now jut out from the *Magot*. And the *vesi-*
cles do now plainly expresse the *Navel*.

The fifth Inspection of the Egge.

EXER. XIX.

The *sixth day* the three *Bulle* of the *Head* doe
more plainly appear, and the *coats* of the *eyes*
are now distinct : also the *Legs* and *Wings* do bud
forth ; as at the end of *June*, the *Gyrini* (which
the *Italians* call *Ravabottoli*, and we *Tadpoles*) be-
gin to have *leggs*, when now they forsake the wa-
ters, loose their *tayl*, and put on the shape of *Frogs*.

The form of the *Chickens Rump* is yet no o-
ther, then that which is seen in all other *animals*,
say in very *vipers*, namely a round slender *tail*.
The *Parenchyma* of the *heart* now groweth to the
scicula pulsans ; and a litle after the *Rudiments* of
the *Liver*, and *Lungs* are discovered, and also the
Bill, all appearing exceeding *white*, especially the
Bill. And about this time all the *Viscera* and the
Guts

Guts may be seen. But the *heart* exposeth it first to sight, and the *Lungs* before the *Liver* or the *brain*. But before all are the *eyes* visible, because of their largeness and blackness of their colour.

And now the *fetus* moves, and gently tumbles and stretcheth out the *neck*, though nothing of a *brain* be yet to be seen, but meerly a bright water shut up in a small *bladder*. And now it is a perfect *Magot*, differing onely from those kinde of *worms* in this, that those when they have their freedom, crawl up and down, and search for their living abroad: but this *worm* constant to his *station*, and swimming in his own *provision*, draws it in by his *Umbilical Vessels*.

The *Viscera* and the *Guts* being now erected, and the *fetus* being furnished with *motion* too; yet the *fore-part* of the *Body* still lyes wide open, being deprived of the *Thorax*, and *Abdomen*; and the *Heart* it selfe, the *Liver*, and the *Guts* hanging out.

About the end of this *day*, and the beginning of the *seventh*, the *claws* are distinguished; and the *fetus* begins to have the *Effgies* of a *Chicken*, it opens the *bill*, and kicks: lastly, all the parts are delineated, especially the *Eyes*. But the *Viscera* or *bowels* are yet so obscure, that *Coiterus* truly affirmeth That he saw indeed the *Eyes* and the *Bill*, but could discover no *Viscus* at all, though never so concealed or confused.

That which followeth from the beginning of the *sixth day* to the end of the *seventh*, cometh to pass sooner in some, and in some eggs later. Now are the *coats* of the *Eyes* seen, though they have nothing in them but a *liquid clear humor*: the *Eyes* themselves are something prominent, or banging out of their seats, and each of them doth no less

exceed

exceed the brain in magnitude, then the head, the rest of the body that is fastned to it.

A litle bubble, like a crest, placed out of the circuit of the brain, supplies the place of the cerebellum, and that is also full of a clear water.

The brain seemeth obscurely divided, and shines not so much as the cerebellum doth, though it look whiter. And as the Heart is now to be seen without the inclosure of the chest, so is the cerebellum, out of the Confinnes of the cerebrum.

In cutting off the Head, I saw (by the benefit of my Perspective) in the Necke, a bloody speck of the veine which ascends to the braine. And by this means onely could I distinguish the rudiment of the Spine, from the other Pulpe, it was of a milkey complexion, but firmer consistence then milk. And so like slender cobwebs, narrow white lines, wandering through the pulp of the body, to give some firmness to the Ribbs, and other bones; and this is much more discernable in the formation of other comparous Animals. The Heart, the Lungs, the Liver, and, instead of Guts, the most slender threds, were all white. The Parenchyma of the Liver grows to the Umbilical vein, there where it enters into the Liver, upon thin fibrous strings: in like manner as the Rudiment of the Body grows to the Heart, passing from the Heart, or to the Vesicula pulmonum. For as Grapes grow to the cluster, buds to their stalks, and the eares of corn to the straw: So the Liver to the Umbilical vessels, like mushrooms out of Trees, or proud flesh in Ulcers, or fleshy tumors which border upon the branches of the Arteries, by which they are fed, and spread sometimes into a vast tumor.

Having had an Eye upon this employment of the Arteries, or circulation of the blood, I have some-

times perfectly cured exceeding great *Hernia car-nosa*, beyond all expectation; providing onely, that the *litle artery* being tyed or cut off, no nu-triment or spirit might have accessiō to the part affected; by which it fell out, that the *fatal tumor* was afterwards easily extirpated either by incision, or aduision.

A certain man, besides other infirmities, (and of this story I can produce many testimonies) had a *Sarcosis* or *fleshy tumor* in his *Scrotum* or *Cod*, bigger then a mans head, hanging down to his *Knees*; and from it, another *Hernia carnosa*, as thick as ones wrist (or a cable) passed into his *Abdomen*, so that the disease growing to so great a height, no man would undertake the Cure, by incision, or otherwise. Yet I perfectly cured this so vast excrescence, which so much distended the *Scrotum*, and encompassed the *Testicle*, by the means aforesaid; and yet left the leading and preparing vessel to the use of the *Testicle*, without any prejudice or touch upon the other vessels descending into the *Scrotum*, by the *Tunica vaginalis*, or coat of the *Testicles* so called. But these and other Cures, accomplished clean beside the common opinion, I shall in my *Physical Observations* (if God grant me life) discover at large.

I mention these things with this intent, that men may plainly see, that the *Liver* grows to the vessels, and is generated some time after the Blood is born, and that its *parenchyma* is produced by the *Arteries*, (which administer matter to frame it) and also that for a while it continues white, and without blood; which is likewise common to other parts of the body. For after the same manner and order, as we have declared the production of the *Chicken* to be out of the *Egge*, doth the generation

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of *Man*, and all other *Animals* proceed. which it appears, how incongruous their person is, (though it hath obtained both of old, and now too) who decree the *Liver* to be both the place where the *Blood* is wrought, and the *Author* of it. And do upon that account, rank it amongst the *first-born parts* of the *Body* : who also give it much renown to this *Viscus*, that they promote it to spring with the *Heart*, from the first beginning, out of the *semen* of the *mother* ; and do thus vainly maintain the Fable *de tribus Capellis*, or three imaginary Bubbles. In which *Quire*, *Pan* of late, with a loud, but unmannageable voice hath sung his part of the *Catch*.

These honest men never took notice, that the *Heart* moves, the *Heart* pants, & the *Blood* is now first concocted, before any track or foundation of the *Liver* appears. Without all question *Blood* is to be counted the *Author* of the *Liver*, and then the *Liver* the *Author* of the *Blood*. For the *Liver* is made *after* the *Blood*, and of it, cleaving the *Veins* that contain the *Blood*.

And yet can I subscribe to the *Aristotelians*, who repute the *Heart* to be the *Author* of the *Blood*. For its substance also, or *Parenchyma* is born with the *Blood*, and is then superadded to the *Veins Pulsantes*. But I am much in doubt whether the *Arteries*, or *Punctum saliens* or the *Blood*, that is to say, whether the *contained liquor*, or the *containing vessel* be the elder. Now it seems in reason, that the *container* is made for the *contained* ; and therefore it. This indeed our eyes can truly witness, that the *Veins* are the first woof, and the first foundation of the body, and that all the other parts are superadded to them, and born after them. But of this matter hereafter more at large.

In the Interim we cannot chuse but smile at that fond and fictitious Division of the *Parts*, into *Spermatical*, and *Sanguineous*; as if any part were immediately framed of the *Semen*, and were not all of one extract and original.

But I return to our purpose. The extent of the *Colliquamentum* doth not reach over more then half the *Egge*. The *Heart* hanging out, stands something off from the *body*. And if you make diligent inspection, you may discover some of the *Umbilical Vessels* beat.

The sixth Inspection of the Egge.

E X E R. XX.

ON the *seventh day* all things are clearer, and the *primordia* of each particular part are now visible; namely, the *Wings*, *Leggs*, *Genitals*, the divided *Claws* of the feet, the *Thighs*, the *Sidesmen* &c.

Now the *Fætus* bestirrs it self, and kicks, and the *Chicken* is found complete, there being no addition to be expected after, but only the growth of the parts yet tender: which the more they increase, the more the *White* decays; and the outward membranes uniting, supply the place of the *Secundina*, or *after-birth*; as also the *Veines* do every day more and more represent the *Nerves*. Therefore I conceive it convenient to pass from the *Seventh*, to the *Tenth day*, because nothing worth observation doth intervene in the meantime, though Authors usually, especially *Aristotle* do not do so.

Notwithstanding all this, if you observe many *Egges* at a time, you shall finde some that are forward, and better grown, have all the parts apparent in them; other *Truants* will present them less distinct. Though on the other side, many things concur to the work, as the *Season of the year*, the *warmth of the Nest*, *Outward cherisshings*, *Diligent Incubation*, and the like. I remember I have sometimes seen in a *sluggish Egge*, the cavity indeed dilated on the *seventh day*, and the *Colliquamentum* sprinkled ore with *veines*, also a *Magot* in the midst of it, together with the rudiments of the *Eyes*, and other things which come to pass in other *Egges*, about the fourth or fifth day; yet there were no *vesiculæ pulsantes* at all: nor could I finde the *Trunke* or root out of which the *Veines* rise. And therefore I justly counted it a feeble backward *Egge*, endowed but with a sickly generative power, and now upon the point to die. And that chiefly, because its *Colliquamentum* was more cleare and refulgent then usual, and the *veines* did also shine a litle. For when the *Vital Spirit* departs, that part first declines and corrupts, which is first in order of *Generation*.

The Inspection after the tenth day.

EXER. XXI.

Whatever is visible the *tenth day*, is delivered so accurately by *Aristotle*, that litle or nothing remains to be added. And this opinion, according to my *Paraphrase*, is thus: *The tenth day*

all the Chicken is visible; and all pellucid, and white save only the Eyes and divarications of the Veines. And the Head is bigger then all the rest of the body besides; and the Eyes stick fast in the Head, or rather stick to the Head as Appendixes, being yet unfurnished of a Pupilla or Eye-ball; (that is, having none yet perfectly formed; and yet it is no hard matter to discover the distinct coats or membranes) for if then you pluck them out, you shall finde them blacke, and bigger then Beanes: from which if you take off the skin, there flows a white, cold humour, very resulgent if you hold it in the light, and beside that humor, there is nothing (namely in the whole entire Head) contained at all. And this is the state of these parts, from the seventh day, to the tenth.

At the same time (saith Aristotle) the Viscera or Intrals also appear, and all the appurtenances belonging to the Belly and Guts; namely, the Parenchyma of the Heart, Lungs, and Liver, &c. but all are white, mucilaginous, and washy, and have no firm consistence in them. And the Veines also that proceed from the Heart, are applied to the Navel. And from the Navel one Vein passeth to the membrane containing the yolke; which is then more liquid and dissolved, then his natural constitution uses to be. But the other, to the other membrane, which containeth the whole membrane (namely the coat of the Colliquamentum) which encompasseth the Fetus, and the Yolke, and the interjacent humour. For while the Chicken grows by degrees, part of the yolke is above, and part below; but the White being in the midst, is liquid. And the white is also under that lower part of the yolke, as it was under it before. So farre Aristotle.

And now you may plainly see the Veines accompany the Arteries; as well those which tend to the Whites, as those which pass to the yolke. The yolke

white also now dissolves, and yet not all of it, but that which lyes uppermost : nor do the *friggs* of the *Veines* run through the whole yolk, but through that part onely which we have said to be like melted wax. So also the *Veines* which tend to the White, have some *Arteries* for their companions. And the greater part of the White it selfe, is dissolved also into that white moisture (called the *Colliquamentum*) which surrounds the *Chicken* swimming in the midst of it, and lieth between the two divisions of the yolk; namely, the *Upper*, and the *Lower* : under which (in the acute angle of the Egge) the grosser and more viscous part of the White remaineth. The Upper part of the yolk appeares now more liquid and resolved, then the Interior doth ; for wheresoever the *fibers* of the *Veines* disseminate themselves, the parts grow presently tumid, and softer.

But *Aristotle* adds, saying, the *White* at the tenth day sinketh down, being now grown less, viscous, thicker, and yellowish ; namely that part of it which is not transformed into the *Colliquamentum*.

Now the greatest part of the *White* is resolved into the *Colliquamentum*, and the *Fetus* ; that is, all the thinner part of the *Albumen*, and the greater part also of the thicker.

But the *Yolk* appears now larger, then it was at first. By which it is evident, that the *Yolk* doth not yet serve for *nutrition*, but is afterwards designed for that office. And as farre as I could conjecture, by the disseminations and distributions of the *Veines*, the *Fetus* is at first nourished by the *Colliquamentum* ; for the *Veines* are first distributed into it alone, and thence into the membrane of the thinner *White* ; and after that, into the grosser *White*, and *Yolk* : so that even the grosser *White*

becomes the nutriment, before the Yolk. For the most tender *Fetus*, whilest it is yet a small *Magot*, is fed with the thinnest diet of best concoction; that is, the *Colliquamentum*, and the thinner *White*. But when it grows more hearty, it is received with entertainment proper for its age and strength.

In the next words, *Aristotle* describes the situation of the particulars contained in the *egge*. At the upper and lower end of the *egge*, doth the membrane of the *egge* reside, not the membrane which belongeth to the *shell*, but under it: and in that membrane is contained the white liquor: (namely the *Colliquamentum*) then the *Chicken*, and the membrane containing it, which provides such a separation, that the *Fœtus* it self doth not wallow in the liquor.

Where I suspect a fault in the Text. For the thing it self speaks, that it should be rather thus. Then the *Chicken* encompassed in a *Membrane*, is seated, or swims in that white liquor; which *Membrane* is not that exterior one, which immediately lineth the *shell*, but another *Membrane*, lying under that: which when the exterior *White* is spent, and the remaining thicker *White* is depressed into the *Acute Angle*, of two *Membranes* (namely, that of the thinner *White*, and that which is proper to the *Colliquamentum*) is made one coat, which begins to appeare like the *Secundine*, called *Chorion*. Yet *Aristotle* saies well, In that *Membrane* is contained the white liquor: for by that he doth not understand the *Albumen*, but the *Colliquamentum* made of that *Albumen*, in which the *Fetus* swims; for the remainder of the *Albumen* is now sunk down into the *Acute Angle*.

The Inspection after the fourteenth day.

EXERCIT. XXII.

From the seventh to the fourteenth day, all parts are enlarged (as hath been said) and more visible. The Heart and all the other *Intrals* are now concealed in the several *Venters* or Bellies of the *Chicken*: and those that before were exposed, and naked, cannot now be seen, but by opening the *breast*, and lower belly. Now is the *Chicken* cloathed in *Plumes*, whose roots appear, like black points. The *Apple* of the *Eye* is now distinct, and the *Eye-lids* are plaine to be seen: likewise the *Membrana Nictatoria*, or membrane moving the *Eye-lid*, is visible in the greater *Canthus* or corner of the *Eye*, which is a membrane peculiar to all birds, by which they cleanse their *Eyes*. Also now the *Gyri* or *Involutions* of the *braine* are distinguished, and the *After-braine* is covered by the *Scull*: and the *Taile* hath attained the form of a *Ramp*.

After the fourteenth day, the *Intrals* (which were white before) put on by degrees a ruddy flesh-colour. The *Heart* now entered into the cavernes of the *Chest*, and being guarded by the *Sternum*, or *Breast-bone*, enjoys the habitation which himselve hath erected. The *Braine* and *After-braine* grow firm and solid in the *Arch* of the *Cranium* or *Scull*. But the *Guts* and *Gisard*, are not concluded in the *Abdomen*, but hang out, being continued and fastned to the rest of the *Intrals*.

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One of the two *Vessels* which are derived to the *Navel* from the *Belly* neer the *Fundament*, is an *Artery* (as the *Pulse* discovers) springing from the *Great Artery*: the other is a *Veine*, conveyed from the *Yolk* by the *Guts* into the *Vena Porta*, or *Gate-vein*, at the *concavous part* of the *Liver*: for the other *Trunk* of the *Umbilical vessels* having received its branches from the *White*, passeth by the *convex part* of the *Liver*, and is inserted into the *Vena Cava*, or *Hollow veine*, neer the *basis* of the *Heart*.

As these parts grow daily more conspicuous, the greater portion of the *White* is daily consumed; but it is not so with the *Yolk*, which is hitherto almost entire, and of the same bulk it was the first day.

In the subsequent dayes, you may see the *Umbilical vessels*, whereof one is a very large *vein*, arising from the *Hollow veine* above the *Liver*, and scattering branches into the *White*: the other two *veines* derived from the *Gate-veine* (having both the same original) are disseminated into the two parts of the *Yolk*; (which we have before described) and have two *small Arteries* which arise from the *Arteries* of the *loins*, accompanying them.

The *Chicken* doth now possess a greater room in the *egge*, then all the other things contained in it: and begins to be *down-feathered*; and the larger the *Chicken* grows, the more the *White* diminisheth. And it is worth the observation, that the *membrane* of the *Colliquamentum*, which we have said is joyned with the outward coate, and with it doth constitute the *Secundine*, or *Cchorion* doth now likewise containe all the *Yolk*, and being grown more contract, doth convey the *Yolk* together

together with the *Guts* to the *Fetus*, and fasten them to it, and shut them up like a purse, where the strings are drawn together. And though it was subtile, and transparent before, yet now as it grows more contract, so it thickens, and becomes more fleshy : and at length, like a *Hernia intestinalis* in the *scrotum* or *Cods* dilated, it covereth the *Guts* together with the *Yolk*, and sustaineth them all : till at last growing narrower by continuall contraction, it constitutes the *Abdomen* of the *Chicken*. You may finde the *Yolk* thus disposed between the *Guts*, the *belly* hanging looser about the 14th day : and yet not so fast rooted, but that the *Guts* (as it happeneth in the *Hernia intestinalis*) easily driven either backward into the *belly*, or downward into the *Scrotum*, may be moved up and down together with the *Yolk*. I have seen the *Yolk* in this manner fall from the *belly* of a *Pigeon*, which in the summer time, had too hastily broke loose from the *shell*.

About this time the *Chicken* hath a huge *belly*, as if it laboured of a *Hernia*. And now the *Colliquamentum* by degrees grows troubled and thicke, being altered, and diminished, (which was before in very great quantity) and the *Chicken* lies brooding upon the *Yolk*. And in those days, before the *Liver* attains a bloody complexion, or executes the office the *second concoction* (as they say) the *Gall* (which is separated by the virtue of the *Liver*, and is an excrement of that *second concoction*, as is commonly thought) is now to be seen, of a green colour between the *Lobes* of the *Liver*. In the *Cavity* of the *Stomack* there is a clear *Liquor*, having the very same consistence, colour and taste, with the *Colliquamentum*, in which the *Fetus* swams; which gliding down the *Guts* changeth its colour by

by degrees, and is converted into *Chyle*; and at last just such an excrement is discovered in the lower end of the *Guts*, as that which the *Chicken* eject after they are hatched. When the *Chicken* are more grown, you shall see the liquor concocted and coagulated in their *Stomack*: as in *Infants* that feed on *Milk*, there is a thick substance, which turns into *Whey* and *Curds*.

And now the *White* being almost spent, and a small quantity of the *Colliquamentum* remaining, the *Chicken* for some days before exclusion, doth no longer swim, (but as we have said) lies brooding upon the *Yolk*; and rousing himselfe up in a heap, his *Head* for the most part being nuzzled between his right *Legge* and *Wing*, he is compleatly accoutered with *Bill*, *Clawes*, *Plumes*, and other furniture. He sometimes wakes, and sometimes sleeps, and stirring himself, respires and cries. If you lay the *Egge* to your *Eare*, you shall plainly hear the *chicken* bussing, kicking out his *Legs*, and according to *Aristotle*, he will stare upon you, and in his manner cry and complaine. If you let it fall gently into warme water, it will swimme, and the *chicken* within it, being roused by the ambient heat, will bound and leap, and the *egge* (as is said) will tumble up and down. And this is the experiment which women make to prove the fruitful from the barren eggs, for the latter sink in the water. When the *White* is now clean consumed, a litle before exclusion, that other *Navel* (which as we said is derived to the *White*) is obliterated & expunged, or as *Aristotle* saith, that *Navel* which is extended to the exterior *Secundine*, is loosened from the *Animal*, and falls off. But that which is conveyed to the *Yolk*, is knit to the small gut of the *chicken*.

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Ex.XXII. *The inspection after the 14th day*

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Hist.an.l.6

c. 3.

The first Excrements that are found in the chick-
as, are white and muddy, like the egge-shell softened
and dissolved. And such also are to be found out
of the Fetus wrapt up in the Secundine. To which
Aristotle consents, saying, At that time the Chick-
in discharges much excrement to the outward mem-
brane. And a white excrement is discoverable, not
only within, but without the belly. But in processe
of time, when the exclusion of the Fetus approa-
ches neerer, the excrement growes greenish, like
that which the chicken ejects after exclusion. And
you may also perceive in his craw, a part of the
Colliquamentum swallowed down, and in his Gi-
lard a schiston, or coagulated substance.

Nor is the complexion of the Liver hitherto ei-
ther purple, or sanguine, but declining from white
to yellow, as the Livers of Fishes, yet the Lungs are
sanguine.

The Yolk is now concluded in the Abdomen be-
tween the Guts: and that not onely while the
chicken remains in the egge, but also when he
is excluded, when he walkes abroad with his
Mother to seek his provision. By which it appears
true, which Aristotle so often repeats: That the
yolk is intended for the Aliment of the Chicken: for
the yolk being shut up within him, the Chicken for
the first dayes after exclusion (till his Bill is confir-
med and strong enough to divide and prepare his
meat, and his Stomack enabled to digest it) feeds
upon it: so that it carrieth some analogy and pro-
portion to milk. Aristotle casts in his suffrage with
us, in the place so often recited. Much of the yolk

Hist.an.l.

6.c.3.

doth now lye under the Chicken: which yolk at last de-
treases, and in processe of time, is all turned into the
chicken it selfe, in whose bowels it is contained: so
that ten dayes after the chicken is excluded, if he be
dis-

dissected, you shall finde even then some small remainder of the yolk adhering to his Intestines. Nay I have found some Reliques of the yolk after the thirtieth day. And, if the argument be of force from the production of the Umbilical veines (which we have shewed to be terminated in the *Vena Porta* of the Liver, by one or two Trunks) the Chicken is now nourished by Aliment attracted by the Umbilical vessels from the yolk: in the same manner as he afterward is sustained by the chyle drawn out of the Intestines by the *Meseraike* veins. For the vessels on both sides are terminated at the Gate of the Liver, whither they do alike convey the nourishment they draw; that we may not flie to the *Vene Lactoe* in the *Mesentery* (which in feathered Creatures are no where to be found)

Give me leave to adde something here, which I have tried often; That I might the better discern the situation of the *Fetus*, and the *Liquors* after the fourteenth day, to the very exclusion: (the greater part of the *White* being now exhausted, and the yolk divided) I have boiled an egge till it grew hard, and then pilling away the shell, and seeing the Situation of the Chicken, I found both the remaining part of the *White*, and the two parts of the yolk (which as we have said before, are divided by *colliquation* caused by the gentle warmth) of the same consistence, colour, tast, and other accidents, as any other stale egge, thus ordered, in. And upon this Experiment, I did much ponder whence it should come to passe, that Improlifical Eggs should, from the adventitious heat of a Sitting Henne, putrefie, and stink; and yet no such inconvenience befall the Prolifical: But both their *Liquors* (though there be a Chicken in them too, and he also with some Pollution and Excrements) should

should be sound, wholesome, and incorrupt; so that if you eat them in the dark after they are boyled, you cannot distinguish them from *eggs* that are so prepared, which have never undergone the *Hens* incubation.

Of the Exclusion, or Birth of the Chicken out of the Egge.

EXERCIT. XXIII.

THE *Egge* is (as we have said) a kind of an exposed *Womb*, and placed where the *Fetus* is formed: for it executes the office of the *Matrix*, and shelters the *Chicken* till its just time of *Birth*: who when he is perfect, is born from thence. *Oviparous* creatures are therefore not distinguished from *Viviparous*, in this, that these bring forth their *Fetus* alive, but they do not; (for the *Chicken* in the *Egge* doth not onely live and move, but doth breath also, and exercise a voice, and being born, enjoyes a perfecter life, then the issues of other *Animals*) but their maine difference consists in the manner of *Generation*; namely, in that *Viviparous* creatures continue their *Womb* within them, in which the *Fetus* is fashioned, cherished, and compleated: but *Oviparous* expose their *Egge* or *Matrix* without: yet nevertheless they do ripen and cherish it as much by *Incubation*, as if they did reserve it within their bowels.

For though the *Mother* do sometimes upon sunny occasions desert the *Egges*, yet her affection

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continues still with them, and making speedy returns, she receives them in her tender bosom, for their strength, and diligently defends them.

But when the Chicken now covets the freer air, the Shell being parted, he entereth into the world, and this about the one and twentieth, or two and twentieth day.

pag. 55.

The Common mistake of Fabricius, and almost all others, concerning this Exclusion or Nativity of the Chicken, must not be passed by. Read Fabricius himself: The Chicken (saith he) doth want the freer aire before it wants meat, because there is yet some element residing within it: in which condition the Chicken being unable to break the shell, in regard the shell is hard, and his bill soft, and also by reason of the distance between them, his bill being sheltered under his wing, he gives his mother a signe, by which he signifies the necessity he stands in to have it broke up, and thus he uttereth by his cry. For the Chicken is at that time solusky, and the cavity so enlarged, and so great a quantity of air contained within it, that his respirations being large, send forth an enufflation, and cry proper to his kinde, and probably such a one as doth express his request; which also she standers by may easily heare: and this do both Pliny and Aristotle mutually affirm. Which clamour of the Chicken commeth to the Hennes eare; and she finding a necessity in breaking the shell, that her darling may enjoy the freer aire to continue its life; or, if you will, she being affected with a strong desire to see her beloved Infant, breaks up the egge with her bill; which is no hard matter to do, since in that place, by reason the cavity hath been long destitute of liquor, and hath been much dried by the aire within it, and the heat without it, the shell is become more fragile, and brittle. The cry therefore of the Chicken, is the first and greatest token of desire.

Lib. 10. c.
53. de Hist.
an. l. 6. c. 3.

of enlargement, and of the exigence it stands in
of Air: Which the Henne so exactly under-
stands, that if it so fall out, that she perceive the
eggs cry to be low, and inward, then she turns
up side down with her feet, that she may cleave
the egg just in that place from whence the voice comes,
without any injury to the chicken. Hippocrates ad-
L. de nat.
another token of the Chickens inclination to get out
Puer.
the shell; namely, that the Chicken being now strait-
for want of sustenance, bestirres himself strongly,
in quest of better feeding; and that the Membranes
every where torne asunder; and that the Mo-
ther discovering these violent Motions of her young,
punching holes in the Shell, delivers it from bow-

Thus far Fabricius, pleasantly and elegantly:
his arguments are not well bottomed. For
it is found by Experience, that the Chicken it
(not the Henne) doth break up the Shell:
this is also most consonant to Reason. For
could the egges which are fostered in Stoves
ovens (as it is in *Aegypt* and elsewhere) be o-
therwise broken up? Where there is no Mother to
relieve the distressed supplicants, nor redresse their
grievings. And so how can the egges of your Land
Tortises, your fishes, silkwormes, vipers, and
others be unlockt, when either the Issues them-
selves are mute and silent, or else lye hid under
the shell, quite out of hearing. Chickens there-
fore are born by themselves, and break loose from
the shells by their own industry. And this I
prove by infallible Arguments. For in the
perforation of the Shell, the gap is so litle,
that it bears no proportion at all with the Bill of
the bird, but exactly answers the chickens; and
is about the hole (in manner of a coronet)

the Shell stands up in splinters, being always pierced at the same distance from the top: and the shivered pieces (especially if the breach be new made) always jets out erect, and tufted. And as when *Glaß-Windowes* are broken, a man may easily discover whether they were burst from within, or without; if he do but take the paines to compare the bent and inclination of the fragments remaining: So also when the egge is pierced, by the erection of the splinters all along the circuit of the *Coronet*, it is manifest that the invasion came from within. And *I my self*, and many more with me, when we have heard the *Chicken* grate and scrape the Shell with his Claws, have presently seen it bored with his Bill, and a circular breach forced through it in the manner of a *coronet*. I have also seen the *chicken* bear up the top of the Shell with his Head, and so shake it off. We have been something large in this subject, because the *speculation* is not to be contemned: as will appear hereafter. But as for *Fabricius*, he is easily answered: For I grant the *chicken* hath a voice in the *Egge*, and perhaps a significant petitory voice: But it doth not thence follow that the *Henne* breaks the Shell, nor that the *chickens* Bill is so soft, and at so great a distance, that it cannot penetrate the Shell; especially since the Shell, according to his own arguments, is now very brittle. Nor doth the *chicken* alwayes confine his Head to his Wings, that so he may be made incapable of working his passage, but then only when he is asleep, or else hath given up the Ghost. For sometimes, as *Fabricius* confesseth, he wakes, kicks, scrapes, scratches, straines the Shell, singes, tears the *membranes* that enwrap him, cries (and that he implores help by these cries,

ways doe not withstand it) and all these actions may any man hear, that has a mind to it. Wherefore the Hen diligently listening, so soon as she discovers the voice to be remote, and come from below, she doth not burst the *egge*, but gently move it to and fro with her *foote*, till she have procured a more commodious situation for the prisoner. Yet it doth no way appear, that the *Pullus* doth by his cry signifie the necessity of his release from the Shell to his *Mother*, or desire an enlargement of her procuring, for you may often times, even for two dayes together before *exclusion* hear him cry in the Shell. Nor doth the *Henne* by the several removes of the *egge*, seeke a convenient place to break it up: but as when the sick *Infant* in the cradle is disquiet, weepes, and roares, his affectionate *Mother* turnes him from side to side, and rocks him till he lye at ease: so likewise the *Hen*, when she finds her *chicken* busling, or crying in the *egge*: or after his *exclusion* tumbling up and down in a distempered posture: she presently starts up, and provides that the weight or heat of her body may not offend him, and moves him from place to place with her *Clawes* and *Bill*, till he have procured his ease and quiet.

Of *Twinne-Egges*.

EXERCIT. XXIV.

They are called *Ova Gemellifica*, or *Twin-Egges*, ^{de hist. an.} which bring *two chickens*; being (as *Aristotle* ^{l. 6. c. 2.} stocked with *two yolks*, which in some are divided

vided with a slender partition of White, to preserve them from confusion : but in others there is no White at all, but the yolks are contiguous.

I have often seen these *Ova Gemellifica* or *Twin-Egges*, where they have had two Whites to every yolk, together with common, and proper membranes respectively embracing them. And I have againe seen other egges where the two yolks did cleave to one another, and were both encompassed with one single Common White.

Ibid.

There are some Hennes (saith Aristotle) which bring none but *Twinne-Egges*, in which the Yolke is clearly disposed, as we said before : for a certain Henne in two and twenty egges, layed none but *Twinne-Egges*; except onely those that were barren. Now it comes to pass, that one of the *Twins* is bigger then the other: but the last is a Monster.

With us sometimes there are *Twin-Egges*, and the *Chickens* also are sometimes *Twins* too, though very seldome. And for my part I never saw two such *Chickens* that both of them lived : but one perished either in the egge it self, or in the *Exclusion*. And this also seems to have befallne *Aristotles Chickens*, because he saith, One was bigger then the other : implying that one of them was hartier then the other, and sooner quickned : but the other weaker, and so less ready to endure *exclusion*: For (I am perswaded that) the two yolks are of different production, and maturity. And therefore it can hardly be, but that the forwarder *Chicken*, being now ripe for enlargement, in breaking up the egge, to make way for his own nativity, must needs induce abortion to his brother: And should he forbear to break up the egge, his own life were in imminent danger, being now streightned for breath. So that in *Exclusion*, the

one

one or the other, receives their inevitable doome.

Fabricius either not observing, or not understanding those words of *Aristotle*, saith: If there chance to be such an egge that hath two yolks in it, the *Chicken* that is produced thence, is born with four legs, and four wings, and two heads, and so becomes a kind of *Monster*: but the *Chickens* never come forth so distinctly two: (is that they may truly be called two) but have onely one main *Trunk* of body, where two heads, and four legs and the like are adjoynd.

Whence it appears, that himself never saw, nor heard by others that had seen it, that such kind of *Egges* produce *Twins*: and therefore he must needs be of my mind; namely, that such *egges* rarely happen; and that they never exclude two vitall *Fetuses*. Yet I cannot but admire that (if he saw this place of *Aristotle*) he should say, that such an egg doth never produce two distinct *Chickens*, but always a *Monster*: especially since he believes, that the *Fetus* is formed of the *Chalaza*, as out of the subject *Matter*, and he could not but see four *chalaza* in every *Gemellifical* Egge. I rather believe that when in a *Gemellifical* Egge there are two *Yolkes* concluded in the same *White*, and are so conjoynd together, that their *cicatricule*, while they are opened together, do constitute one *Eye* (which we call the *colliquamentum*) a *Monster chicken* may be then produced, having four *Legs*, two *Heads*, &c. because I can see nothing to hinder it; and such a one I suppose was bred of *Fabricius* his Egge.

Yet nevertheless, where the two yolks are distinct, and separate by their proper *Coats*, and are furnished with their *Grandines*, and *Whites*, and other necessities conducing to the *Generation*

of the *Fetus*: I conceive we ought to conclude with *Aristotle*, that such an *egge* as it hath all the parts required to two *egges* (save only the *Shells*) so it obtaines the virtue and power too; and unless it be barren and addle, will for the most part produce two *chickens*, but seldom a single *Monstrer*.

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CERTAIN THEOREMS

taken out of the foregoing Hi-
story of the *Egge*.

EXERCIT. XXV.

THe History of the *Hen-Egge*, is such as hath been said. Wherein we have delivered how the *Egge* it selfe is generated, and how by its *Action* (which is *Propagation*) it formeth the *chicken*.

All which, hath perhaps been sufficiently prolix, and tedious to such who are not yet acquainted, whither these so great undertakings, and so exact and accurate Observations, tend. And therefore I hold it convenient to discover what fruit and advantage may be reaped by my labour: and hereupon (to use the expression of our most learned *Verulamius*) we shall proceed to our *Second Vintage*: collecting certain *Theorems* out of our former History; some of which are Infallibly True, some Doubtful, and must submit to a farther Discussion: Some are Paradoxical, and contrary to the received opinion: Some of them also relate

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to the *Cock*, or Male, some to the Female; some, to the *Egge* it self; and lastly, some to the *Formation* of the *Pullus*. Which when we have once thoroughly discussed, and understood, Our knowledge and insight into the *Generation* of all other *Animals*, will be lesse exposed to difficulty, and Errour.

What an Egge is.

EXERCIT. XXVI.

THe *Theorems*, which are employed about the Contemplation of the *Egge*, some do teach what an *Egge* is, some what its *Generation*, and others what *Parts* go to its *Constitution*.

One Chick- And first It is evident, that One *Chicken* pro-
ceeds but from one *Egge*: which though it be a
kind of an exposed *Womb*; yet it seldome produces
from One more *Chickens* then One. And though sometimes it
Egge. produce two, yet that *egge* is not to be accounted
a *single*, but a *double egge*; as having obtained both
the Nature and Parts of two *eggs*.

An egge For the *egge* is a certain Conception proceed-
ing from Male and Female, qualified with the
is a Con- power of both: and out of it being One, one *A-*
ception. nimal is constituted.

Both the Nor is it the Beginning, but the Fruit also, and
Beginning the End; Namely, the *Principium*, the Beginning
and the or Principle of the Offspring, that is to be genera-
Fruit. ted; but the *Fructus*, the Fruit of Both Parents;
namely, the *Cocks* and the *Hens* Work (or *End*,
which

which they proposed to themselves in *Generation*) and the *Original* of the future *fatus*. Now, the *Seed* and the *Fruit* (according to *Aristotle*) are distinguished from one another, under the notion of *Former*, and *Latter*: for the *Fruit* is that which is made out of another, and the *Seed* is that out of which another is made; for otherwise they were both the same.

De gen. an.
l. 1. c. 18.

The *Egge* also seemes to be a kinde of *Medium*; It is also not onely as it is the *Principium*, and the *Finis*, but as it is the *Common* work or production of both *Sexes*, and compounded of both: which containing in it self the *Matter*, and the *Efficient* or *Operative Faculty*, it hath the power of both, by which it produceth a *Fatus* like to *One*, or the *Other*. It is also a *Medium*, or thing between an *Animate* and an *Inanimate* creature; being neither absolutely impowered with life, nor absolutely without it. It is a *Mid-way* or *Passage* between the *Parents* and the *Children*; between those that were, and those that are to come, and the very *Hinge* and *Center* about which the *Generation* of all the *Race* and *Family* of *Cocks* and *Hennes* doth move, and depend. It is the *Terminus à quo*, the *Point* or *Original* from which all the *Cocks* and *Hennes* in the world do arise and spring: and it is also the *Terminus ad quem*, the *Aim* and *End* proposed by nature, to which they direct themselves all their life long. By which it comes to pass, that all *Individuals*, while to supply their *Species* they beget their *Like*, do continue and perpetuate their duration. The *Egge* is at were the *Period* of this *Eternity*; for it is hard to say, Whether the *Egge* be made for the *Chickens* sake, or the *Chicken* for the *Eggs*. Now, which of these two, namely the *Egge* or the *Henne*, have the priority in *Nature*, or *Time*, we shall now copiously handle, when we come

It is also
a certain
Medium.

It is also
the Sper-
ma.

come to discourse of the Generation of all Animals in general.

The Egge also (which is chiefly to be noted) answers in proportion to the Seeds of Plants, and hath obtained the same qualifications with them, so that it may justly be stiled the Sperma, and Semen, or Seed of the Hennes (as also the Seeds of Plants may be rightly called *Ova Plantarum*, the Plants Egges) not onely *ex quo*, out of which, as out of a subject Matter; but also *à quo*, by which, as by an Efficient cause, the Chicken springs. In which also there is no part of the Future Fetus, actually in it, but yet all the parts of it are in it potentially.

Ibid.
The difference
between
Sperma &
Genitura.

Now, Semen, or Seed properly so called, doth differ from Genitura, Geniture, because (according to Aristotles definition) That is called Genitura, which proceeding from the Male-Parent, is the chief and principle cause of Generation; namely, in such as nature hath designed to coition; but the semen is that, which proceeds from both Parents in the act of coition: the Seed of all Plants is like to this, and so is the Seed of some Animals, which have no distinction of Sex at all, being as it were at the first a kind of mixture of both Sexes, or promiscuous conception, or Animal: for these kind of creatures have in their single selves, as much as is required of both Sexes.

An Egge therefore is a Natural Body endowed with an Animal power: namely, with a Principle of Motion, Transmutation, Rest, and Conservation. And lastly, it is such a thing, as all impediments being removed, it will passe into an Animal: nor do heavy bodies, when all obstacles are out of their way, tend downward more naturally; then Seed, and the egge, do by an inbred Natural Propensity incline to become a Plant, or an Animal.

And the Seed also, and the Egge, are the First

and End, of that very thing, whose Beginning and Efficient they are.

Of One Chicken there is but One Egge: So Aristotle, Of One Seed is begotten One Body; as for example, of One Graine of Wheat, One Eare; of One Egge, one Animal; for a Twinne-egge is Two Eggs. Gen. an. l. 1. c. 20.

And so Fabricius saith, Truly: An egge is not only an exposed Uterus, and place of Generation, but the very thing also on which the entire Generation of the Chicken depends; which the egge accomplisheth, both as Agent, as Master, as the Place, as the Instrument, and all other things, whatsoever are necessary requisites to Generation. He proves it to be an Organum, or Instrument, because it consists of several parts, and that according to Galen, who requires this to the very being of an Instrument, that it be composed of divers particles, which conspire all to one Action, but under several capacities, and for several uses: for some of these parts are the chiefe Agent in the Action; some are necessary Assistants, without which the Action could not be performed at all; others conduce to the more convenient & better performance; and lastly, some againe, to the wellfare and preservation of all the rest. And he also proves it to be an Agent, where he propounds out of Aristotle and Galen, the two actions of the Egge; namely, the Generation, and Augmentation, and Nutrition of the Chicken. And lastly, he saith exceeding well, when he affirms, that in the Operations of Nature, the Artificer or Agent, the Instrument, and the Matter are one and the same thing: So the Liver is both the Efficient, and the Instrument of sanguification: and so the other parts of the body: wherefore Aristotle was in the right, saying, It is hard to distinguish the Agents from the Instruments. In artificial Operations indeed the Agent and the Instrument are divided, as the

pag. 47.
de gen. an. l. 2. c. 4.

l. de form.
Fet.

Phys. l. 1.
c. 1.

the Smith and his Hammer, the Painter and his Pencil. And the reason is rendered by Galen, because in artificial Operations, the Artificer is without Work; but in Natural the Efficient cause is included in the Instruments, and received with intimacy in the very substance of the Organ. To which I add those Perspicuous passages of Aristotle, Of things that are, some are caused by nature, and some by other causes: by Nature do Animals, and their Parts also Plants, and simple bodies, as the Earth, Fire, Air, and Water, consist: For these and the like, we say are made by Nature. Now all these forenamed creatures seem to be differenced from those things which are not made by Nature. For all those things that are made by Nature, seem to have in themselves a Principle of Motion, and Rest; some in relation to place, some in relation to increase and diminution, and some in relation to alteration. Now a Horse-Litter, and a Garment, and all such kinde of things, according to their severall notions, as farre forth as they are the products of Art, they have no inbred principle of Mutation: but so far as it chanches, that they are framed of Stone, or Earth, or bodies composed of these, so far they have one. As if Nature were a certain principle and cause, why that thing doth move, and rest, in which it first is, of it self, and not by Accident. Now I say, not by Accident; because it may come to passe that a man may be the cause of his own health, in case he be a Physitian: Yet he is not in health under the same Respect, as he is a Physitian; but it is a mere Accident, that the same Man should be in Health, and a Physitian too. And therefore these two things are sometimes apart. And thus it is in all other artificial things: for none of them have in themselves an Efficient Principle, but some of them have such a Principle in others, that are without themselves, as a House and

Whether Manual Productions: some indeed have it in themselves, but not by themselves: namely, all those things which may by accident become causes to themselves. Nature therefore is that thing which she hath already been said to be. And all those things have Nature in them, which have such a kind of Principle. And all those things are substances. For Nature is ever the subject, and in some subject.

We have related these Passages more at large, The Efficient Cause of Generation is in the Egge. and in their Authors own words; that so it may appear, that what we attribute to the egge, is really in it; namely, the Matter, the Organ, the efficient Cause, Place, and what ever else is required to the Generation of the Pullus. And chiefly, for the clearing of some most difficult questions, namely, which is, and what kind of Principle is, from whence Motion and Generation do proceed? Also, by what Power the Seed doth act, according to Aristotle? And lastly, what it is that doth inspire and qualifie the Seed with its fecundity? (For Aristotle decrees, that Nature is the Principle of Motion and Rest, Innate in all bodies, and not Accidental.) Whether that which in the egge, is the Cause Efficient, and Principle of Generation, and of the Vegetative and Vital Operations, be some Innate thing in it, or something Added to it? And whether it be in it first, and by it selfe, as a kinde of Nature: or else by Accident, as the Physician is in the Cure? Whether it be some Inbred, or some Acquired power which doth transform the Egge into a Chicken; or nourish it when it was but begun in the Ovary, augmenting, and perfecting, also preserving it while it is not Set upon by the Henne.

Moreover, what it is that fructifies the egge, whether it be to be called the Soul? or a Part of the

the Soul? or some faculty of the Soul? or some thing that has a Soul? or an Intellect? or lastly the Deity? because it acts for some end, and disposes all things by providence, and inimitable art, and after an incomprehensible manner; and always provides what is best, both for the being, and well-being; as also for defence, and ornament. And this not onely in a perfect egge which it fructifies, but even in a subventaneous one too, nourishing, augmenting, and preserving it. And doth not onely supply and nourish the yolk in the Vitellary, but that very little speck (whence that proceeds) being of no greater magnitude then Millet, or Mustard-seed, which it feeds and enlarges; and at last invests it with the White, the Chalaze, the Membranes, and the Shell. For it is probable, that even an Improlifical, barren egge, by an innate and inbred principle (though it be contained in the Bowels of the Henne, and adheres to her) doth feed, conserve, augment, alter (in like manner as Fishes and Frogs-egges, which being exposed do grow, and are perfected) and transforme it self out of a small Whelke or speck into a yolk, and afterward take its journey from the Ovary to the Uterus (though it have no Connexion to the Uterus) and there inrobe it self in the White; and at last compleat it self with the Membranes, Chalaze, and Shell.

But be it what it will, which doth alike both in a Subventaneous, and in a Fruitful, equally produce the same effects, after the same manner, and from the same Causes or Principles; whether it be the same Soul, or the same Part of the Soul, in both it is very well worth our inquiry. Now in probability, the same things do spring from the same Causes.

Though

Though the egge while it is making, is contained within the *Henne*, and grows to its parent in the *Vitellary* by the *Pedunculus* or stalk, and is supplied from the *Hens* veins: yet may it not be said to be a Part of its mother, nor to take life and nourishment from her soul, but from its own proper power, and intrinsecal principle: As Mushrooms, Mistletoe, and several kindes of Moss are bred out of Trees, (which though they adhere to the trunk, and are sustained by the same sap with its own blossomes, and leaves, yet are they not Parts of those Trees, nor are they called so. *Aristotle* de gen.an. l. 3.c. to salve these doubts, allows a Vegetative soul to be in the very Subventaneous Egge, where he saith, Both Females, and all things that live, have a Vegetative soul, as hath been often said: Wherefore this Egge (treating of a Subventaneous egge) considered in the Conception of a Plant, is perfect, of an Animal, is imperfect. And in another place he teacheth the same thing, enquiring: After what manner do Subventaneous egges said to live? for they cannot be said to live as fruitful egges live: For then an Animal might be produced out of them. Nor are they in the condition of Wood, and Stones; because they perish by a kinde of corruption, as things that formerly did in some sort partake of life. It is certain therefore that they have some Potential soul: But what Soul is that? doubtlesse that Soul which they last enjoyed, which is a vegetable Soul; for this is indifferently in all Plants as well as Animals.

And yet the same soul is not in Subventaneous Egges, and in fruitful. For if so, A Chicken might alike be formed out of both. But how their Souls differ, and in what, *Aristotle* doth not sufficiently declare, in his enquiry, Why all the parts of an egge are framed in a Subventaneous Egge, and yet

Whether the Egge be a Part of the Henne?

de gen.an. l. 3.c

de gen.an. l. 2.c.4.

yet an *Animal* is not procreated thence ? Because (saith he) it is necessary it should have a *sensative soul*. As if in fruitful Egges there were a *sensative soul*, besides the *vegetative*. Unlesse you apprehend it thus, that the *Vegetative soul* is *Actually* in a fruitful egge, which contains in it a *sensative soul*, in *Potentiâ*; out of which afterwards an *Animal*, and the *sensative parts* of an *Animal* are produced. But this doth not sufficiently salve the scruple, nor release the mind involved in perplexities and doubts. For an Egge seems to be the true *Sperma* of an *Animal*, according to that of *Aristotle*. In those things that have life, and no distinction of Sexes, the Seed is a kind of Conception already. I call that a Conception (which bears proportion to Seed) which is the mixture of Male and Female; wherefore out of one Seed proceedeth one Body, v. g. out of one egge one *Animal*.

de gen. an.
l. 1. c. 20.

What
soul is
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One egge therefore seemes to have one *Soul*: now whether is that *Soul* the soul of the *Henne*? or of the *Cock*? or a mixt soul of Both? For the doubt chiefly concerns those egges, which proceed from *Animals* of a distinct kind: as out of a dunghill *Henne*, and a *Cock Pheasant*. I enquire whether such an egge participate of the soul of the *Henne*, or of the *Pheasant*? or is the soul of the Egge compounded of them both? But how can there be a commixture of souls, if (according to *Aristotle*) the soul (as being the form) be an *Act*, and a *Substance*. For no man can deny, but that that thing whatsoever it be, which is the Principle and Cause of those Effects which we see produced in a *Fertile Egge*, is a substance susceptible of divers powers, forces, and faculties, as also of several conditions, vertues, vices, health, and sicknesse. For some Egges are longer lived then others: and some do pro-

procreate *Chickens* endowed with the virtues, and soundnesse of constitution of the parents; and others produce them inclinable to distempers. Nor can we for this inconvenience accuse the Matter, out of which they are generated, since the diseases of the Male are sometimes transferred to the *Chickens*; who is not concerned any thing at all in the Matter of the egge. For from the Male the *Plastical* and *Generative* faculty onely doth proceed, which renders the egge fertile, but doth constitute no part of it. For the *Geniture* which is emitted from the Male in *Coiton*, doth not enter into the *Matrix*: (where the *Egge* is formed) Nor (as we have said before, and *Fabricius* also joynes in the Suffrage) can it any way penetrate those recesses, and much lesse the *Ovary*, which is seated neer the *Precincture*, or *Midriffe* of the body, that so it might communicate any portion of the Matter, or any thing at all besides its single *Virtue*. For constant experience testifies, that one and the same act of *Coiton* doth fructifie many *egges* together: and not onely those that are existent in the *Uterus* and the *Ovary*; but those also that are not yet begun: as we shall declare hereafter, and have already proved in our History.

If therefore the *Egge* be rendered *Fertile* from its own proper soul, or be endowed with an innate fructifying principle of its own; by which either a *dunghil Chicken*, or a mongrel-issue between the *dunghil-Henne*, and the *Cock-Pheasant* doth arise; and that either *Male*, or *Female*, like the *Male*, or *Female-Parent*, sound, or sickly; we must then conclude, that the *Egge* (even while it is contained in the *Ovary*) doth not live by the *Soul* of the *Henne*; but is a freborn, Independant Issue from every first original: As the *Acorne* taken off from

The *Egge* doth not live by the *Soul* of the *Henne*.

the *Tree*, and the *Seed* from the *Plant*, are no longer to be counted parts of them; but creatures, as it were, at their own dispose; living and subsisting by an inbred vegetative faculty peculiarly their own.

Now if we affirm that a *Fertile Egge* hath a soul, a question will arise; whether that self-same soul, be now at present in the *Egge*, and how after in the *Chicken*, or whether their souls be distinct. For we must of necessity acknowledge, that some Principle there is which doth constitute, and nourish the *egge*; and also that there is a Principle which produceth and sustaineth the *Chicken*. The question therefore is, whether the Principle, or soul of the *Egge* and *Chicken*, be one and the same, or more then one, and diverse? For if there be more then one soul; (namely, one which belongs to the *Egge*, and another to the *Chicken*) it will be farther enquired, whence, and at what time the *Chickens* soul arrives to it? And what that is in the *Egge*, which dilates the *Cicatricula*, raises the *Yolk* to the top, and produces that *Egg*, (which we call the *Colliquamentum*) alters the Constitution of the liquors, and doth predispose all things for the fabrick and structure of the *Chicken*, when as yet there is nothing at all of the *chicken* existent? Whence also can we pretend that proper and convenient Aliment is derived to the *Chicken*, to sustain and augment it, when there is yet no *Chicken* at all? For these operations seem to belong to the *Vegetative soul* of the *Chicken*, because they relate to the *Chickens* use; namely, *nutrition*, and *Augmentation*. But now, when the fabrick of the *Chicken* is in hand, and half-perfected, what is it that makes the *Fetus*, One, the same thing with the *Liquors*, conjoining them

together by continuity, and condescence? What is it that feeds, and enlarges the *Pullus*; that doth vindicate those juices which are advantageous to its nourishment from Putrefaction, preparing, melting down, and concocting them?

Since the *soul* is the *Act* of an *Organical Body*, which hath life in *Potentiâ*, it is an incredible thing that that *soul* should be in the *Chicken* before its body have received any *Organization*. Nor yet can we believe that the *soul* of the *egge*, & the *chicken* is one and the same: for the *soul* is the *Preserver* of that thing only, whose *soul* it is; but the *Pullus* and the *Egge*, are two distinct things; and do exercise not only *distinct* vital operations, but *Contrary*; in so much that one of them seems to result from the *Corruption* of the other. May we then say, that the *Cause* and *Principle* of life to them both is one and the same? namely to the *Chicken* which is yet but an *Embryo*, and to the rest of the *Egge*, as if it were the simple and single act of one and the same body; or as if out of the parts constituting one natural body, one *soul* did spring, which were *all in the whole* (as they say) and *all in every part*. As we finde in the *Trunk*, *Leaves*, and *Fruit* of a *Tree*: in which, wheresoever we make a separation or division (be it in what part it will) we see, that the first *Cause* and *Principle* of that part, is the same with that of the *Whole*, as being the *Form* and *End* of the *One*, but the *Principle* only of the *Other*. For so in a *Line*, in what point soever a division be made, it will be the *End* of the *re-going* part, but the *Beginning* of the *subsequent*. And the same thing may seem to befall in *Quality*, and *Motion*; namely, in every *Transition*, and *Generation*.

And so much at present concerning these mat-

ters: which we shall more exactly, and more copiously handle, when we treat in General of the *Nature of the Soul of the Fetus*, of any Animal whatsoever; as also what it is? From whence, and when it comes? What part it takes first possession of? and how it is all in the Whole, and all in every part? And also how it is the same, and yet diverse? All which we shall determine and resolve out of multiplied experiments.

*That the Egge is not the Production
of the Womb, but of the Soul.*

EXER. XXVII.

pag. 8.

AS we conclude (saith Fabricius) the Action of the Stomack to be Chylification; and the action of the Testicles to be the Generation of Seed; because the Chyle is found in the Stomack, and Seed in the Testicles: So we positively resolve, that the Generation of Egges is the action of the Uterus of the Fowle, because the egge is found resident there. So then we evidently know, and understand, which is the Instrument and Place of the Generation of Egges. But againe, since there are two Wombs in a Fowle, the Superior and Inferior, and those much unlike one another, and therefore their Actions are divers, yet it is apparent which action is peculiar to each. For the Superior is ordained for the Generation of the Yolk, the Inferior of the White, and the other parts, of the whole, as is evident even to sense: For in the Superior nothing is contained but a throng of Yolks, but

the Inferior the entire perfect egge. And yet this is not all the employment of the Womb; but the Augmentation of the egge, which presently insueth after the egge is generated, and continueth till it be completed and have attained its just stature or magnitude, is also implied herein. For a Hen doth not naturally lay her egge till it be perfect, and have its just proportion. The Action therefore of the Womb, is both the Generation and Augmentation of the Egge. Now Augmentation includeth and supposeth Nutrition. But since all Generation is effected by two; namely, the Agent, and the Matter; The Agent in the procreation of Egges is nothing else, but the Instrument or proposed Organs; namely the twofold Uterus. But the Matter is nothing else but Blood.

Now we, though we acknowledge the Action of the Uterus to be in some sort the Generation of the Egge, yet we do not agree upon any termes in the world, that the Egge is nourished and encreased by the Uterus. And this both for the reasons before alledged, when we discoursed concerning the soul of the Egge, which nourisheth it: and also because it is an improbable thing, that an External Agent (as the Womb is, in regard of the Egge) should form, nourish, and augment all the interior parts of the Egge, according to their several dimensions: nay according to Aristotle, it is altogether impossible. For how can an agent that is extrinsecal in respect of the patient, work upon the Aliment that is elsewhere provided, and restore it into the place of that which is wasted away, according to all dimensions; or how can any thing be affected and altered by that, which doth not touch it? Therefore doubtlesse the same things befall the Generation of Egges, as happen to the exordiums of all living creatures; namely, that they

de gen. an.
l. 2. c. 1.

should be constituted by some preexistent external thing ; but presently (upon the reception of life) nourish, and augment themselves ; and that by a proper inspired efficacy, proceeding from a Principle which is now borne, and implanted in them.

What we have lately delivered concerning the soul, doth seem to evince clearly, that the Egg is neither the Workmanship of the Uterus, nor controuled or governed by it : For it is apparent that even a *Subventaneous* egg is furnished with a Vegetative Soul, because we discover even such an egg also to enjoy Vegetation, Nutrition, Augmentation, and Conservation, which are infallible signs of the fore-said Soul. Now these faculties cannot issue out of the *Mother*, or *Matrix*, because the Egg hath no Coherence, or Union to it ; but tumbles and roules in its Cavity free, and disjoyned (like a Son who hath obtained his Freedom) and growes up to perfection, as the Seeds of Plants do in the *Womb* of the *Earth*, by an internal Vegetative Principle, which can be no lesse then a *Vegetative Soul*.

Much more will it appear, that it hath a Soul, when we consider, after what manner, and by whose impulsion, the Round and Ample Yolk, being now loose from the *Vitellary*, maketh its descent through the *Infundibulum*, (which is a slender *Tunnel*, wrought with a most thin *membrane*, which hath no provision of *motory fibres*) working out its own way, till through all those straits it arrive at the *Uterus* ; where it nourisheth, augmenteth, and invests it self in the *White*. And yet all this while, there is no *Motory Instrument* at all in the *Vitellary*, which should expell it thence, nor in the *Infundibulum*, which should transmit

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it, or in the Uterus which should attract it: Nor is the Egge fastned by veins to the Uterus, as in the Quarry; nor hath any dependance upon it by the Umbilical Vessels; as Fabricius truly affirms, and is obvious to every eye. What then remains, but that upon discovery of such wonderful Operations, we should cry out with the Poet,

*Spiritus intus alit, totamque infusa per artus
Mens agitat molem.* 6. Ænead.

An innate Spirit feeds, an Infus'd Soul
Into each part, doth the whole Mass controul.

And though the first ground-workes of Egges (which we have proved to be but Whelkes, as it were; and of the magnitude of the Seed of Milke) do cohear to the Vitellary by the mediation of Veins and Arteries; (as the Seeds of Plants are both adhearing to the Plants) and thereupon seem to be Parts of the Henne, and to be nourished and live after the manner of other Parts: yet it is evident, that as the Seeds of Plants being dis-united from the Plants, are no more accounted parts of them; no more are Egges, now come to maturity, impowred with fertility, and separated from the Vitellary, any longer to be ranked amongst the Parts of the Henne, but like a Son come to age, and at his own dispose, are regulated and enliven'd by their own proper soul.

But of this more fully hereafter, when we shall discourse concerning the Soul of an Embryo in general; and of the excellence and divinity of the Vegetative Soul, ordering all things after a wonderful manner: (which providence, art, and divine discretion, as farre exceeding our capacity,

152 *That the egg is not the production* Ex. XXVII
as God excells Man; and therefore are (confessed
by all) truly admirable, not to be gazed upon by
our cloudy apprehensions, by reason of their in-
effable lustre.

Hist. an. l.
5. c. 32

What shall we say then of those little Animals,
which are begotten in our own bodies, which no
man ever doubted to be regulated and vegetated
by their own proper soul? And of this kind are
Worms in the *Stomack*, *Guts*, and *Fundaments*; *Lice*,
Nittes, little *Wormes* in the *Flesh*, *Mites*; Or what
shall we resolve concerning those *Wormes*, which
proceed from *Plants*, and their fruit? such as
you may finde in *Galls*, *Nuts*, the *Scarlet-Berry*, and
Eglantine, &c. For an *Animal* may be created al-
most in all drye things, growing moist, or moist things
growing drye. It is impossible that those *Animals*
which are bred in the *Galls* should be enlivened
by the *Oke* soul, though they live joyned to the
Oke, and provide their *Aliment* out of the *Sap* of
the *Oke*. And so it is credible, that the very *Ra-*
diments of the *Eggs*, while they are yet in the
Cluster, do subsist by their own, and not by the
Hennes Soul, though they are united to her by
Veins and *Arteries*, and she also do administer
nourishment to them. For (as we have observed
in our *History*) the *Whelkes* do not all grow at
once (as *Grapes* grow in the *Bunch*, and *Graines*
in the *Eare of Corne*) as if they were inspired by
the same concocting and formative faculty; but
are increased one after another; (as by their own
efficacie) and that which first separates its selfe
from its fellowes, changeth colour and consist-
ence, and of a *White Whelke* is made a *Tolke*;
and so they follow one another in order: And
which is more remarkable, in *Pigeons*, and some
other *Birds*, they grow up from the *Cluster* in
pairs

quires to make up one *Laying*, and one of them proves for the most part a *Cock*, and the other a *Henne*. And yet in the meane time some of the *Papulae*, or *Whelks* in the *Ovary* stay at a stand, till two other grow up for a new production, which have received fecundity from the repeated coition of the *Male*; and are both inspired with a *Soule*. Which when they have received, they order themselves, and grow; living at their own, not at their Parents command. For indeed what can you fancie to dispose, select, separate, and perfect these *Papulae*, or *Whelks* (rather then the other) unless it be their own proper soules. For though they assume nourishment from their Parent, yet they doe it no otherwise, then the *Plants* attract from the *Earth*, or the *Fetus* from the *Yolke* and *White*.

lastly, because the *Papula* continuing in the *Ovary*, receives its fecundity from coition, and such a one too, that it by and by passeth into the forme of the *Cock* concerned in the coition; (whether it be *Dunghill-Cock*, or *Cock-Pheasant*). and since so great a difference befalls the *Papula*, as there is in the *males* themselves of different kinde, what shall we conclude to be in the *Papula* themselves, by whose virtue they are distinguished both from themselves, and their female parent? Doubtless it must needs be the *soule*, by which they are diversified both from one another, and from their Mothers also.

And just in this manner doe *Mushromes*, and *Plants* growing to *Trees*, live. We discover likewise often in our own bodies, that *Cancers*, *fleshy*, and also *phlegmatical Tumors*, and such like swellings, are supplied and fed as it were with their own proper vegetative soules; while in the interim the

the true and genuine parts of the Body, doe ex-
 nuate and wither: And that because these tumors
 doe seduce all the aliment to themselves, and so
 defraud the rest of the body of its fostering juyce
 (as of its *Genius*) whence they are called *Phage-*
dane and *Lupi*, Devouring Cankers and Wolves.
 And perhaps *Hippocrates* by his *τὸ δεινόν*, under-
 stood those diseases, which spring from venom,
 or contagion; as if they were furnished with a
 life; or inspired with a certain divine principle,
 by which they provide for themselves, and pro-
 pagate their kinde, and so did beget by contagi-
 on distempers like themselves, in several persons.
 Wherefore (*Aristotle* saith) *Animæ plena sunt om-
 nia*, All things are filled with a soule. And in
 another place, he conceives that even Wind hath
 its life, birth, and deace. But the yolke, which
 it is now divorced from the *Ovary*, and spoiled of
 all commerce with the *Henne*, then doubtless (as
beans and such like pulse derive of their own ac-
 cord humidity from the Earth, which they im-
 bibe, and digest) passing through the *Infundibu-
 lum*, and residing now in the Cavity of the *Ute-
 rum*, it doth attract a slow thick moisture, which
 it receives into it selfe, and from it obtaineth nu-
 trition and augmentation, begins it selfe with the
White (and being ingarrisoned in the membranes
 and the shell, is at last exact and perfect. All
 which being daely considered, wee conclude
 that it is stored with a peculiar soule of its
 owne.

De Gen.

an. l. 3. c.

11.

Ibid. l. 4. c.

11.

That the Egge is not made without
a Henne.

EXERCIT. XXVIII.

TO omit what ever is in dispute ; and to wave
all controversies till we come to the General
contemplation concerning this subject ; we now pro-
ceed to things of more certainty, & more obvious.
And first it is manifest that an Egge cannot be
made fertile, without the help of the Cock and
Henne. For without a Cock it cannot be frui-
ted, without a Henne it cannot be at all. And this
is opposite to that opinion, which deduceth the
first rise and fabrick of all living creatures out of
the clay of the Earth. For since the several parts
of Generation (namely the Testicles and Leeding
Vessels in the Cock) are formed with such eminent
Art, Industry, and Reason, and likewise the O-
vary and Vterus in the Henne, together with the
Veines and Arteries which are subservient to them,
are so skilfully composed, and the situation, fi-
gure, and temper of every particular, are dispo-
sed in a miraculous method ; and all these things
are some way or other required to the generation
and fecundity of the egge : most certain it is (for
nature makes nothing in vain, nor doth she go to
work by digressions, where she may be more com-
pendious in her dispatch) that an egge cannot be
any other way produced, then now it is ; (namely,
by a cock & a hen) neither by nature of her own ac-
cord, nor by any other means whatever ; nor can ei-
ther cock or hen be produced, but from an Egge. So that
the cock & the hen are made for the Eggs sake, and
likewise the Egge for the Cock and Hens sake : and
you

you may be justly doubtfull with *Plutarch*, which of these is first, namely the *Egge*, or the *Henne*. For she was first in order of *Nature*, but the *Egge* in order of *Time*. For whatsoever excels, is first in order of *Nature*; but that from which another is produced, is first in order of *Time*. Or else we may say, That that *Egge* from which this or that particular *Henne* sprung, is of more Antiquity than the *Henne*: and so on the contrary, That *Henne* which produceth this particular *Egge*, is elder than it. For this Vicissitude and Circuite perpetuates the Race of *Cockes* and *Hennes*; while now the *Chicken*, and now the *Egge* by a constant series and return do continue an Immortal *Species*, out of the decay and ruines of the *Individuals*. And after this sort do many *sublunary* creatures emulate and approach to the Perpetuity of *Celestial* bodies.

And whether we affirm a soul to be in the *egge* or not, yet by this circinvolution it appears, that there is some principle of the vicissitude from the *Henne* to the *Egge*, and again from the *Egge* to the *Henne*, which confers a sempiternity unto them. And that very thing (saith *Aristotle*) beareth an Analogie to the substance of *Starres*; and causeth the Parents to propagate, and their seed, or eggs, to be prolificall: and is like *Proteus*, disguised in several formes, ever existent both in the Parents, and in the *Egges*. For as that *Minde* or *Spirit* which rules the world, doth continually reduce the same *Rising* and *Setting Sun* from several Quarters and Regions of the Earth: so also in the Progeny of *Cockes* and *Hennes*, the *Vis Entbea*, or divine Principle, which is now called the *Plastical*, sometimes the *Nutritive*, and sometimes the *Augmentative* Power or Virtue, is also ever conceived to be the

de gen. an.
l. 2. c. 3.

Confer-

Conservative, and Vegetative too : and now putting on the form of the *egge*, and now of the *Chicken*, continues for ever. And though some *Animals* are born of their own Accord, or (as they commonly say) of *Putrefaction* : and others only produced from a *Female* (as *Pliny* notes in some kinde of living creatures there is no *Male* at all ; as in the *Raffles*, and the *Reches*: for they are all taken great with *spawn*) yet whatsoever is produced from a perfect *egge*, doth not proceed but from both *Sexes*.

And therefore, saith *Aristotle*, *The Male and the Female are chiefly to be counted the Principles of Generation*. The *Cock* therefore and the *Henne* are the two first *Principles* of the *egge* ; the *fruit*, or common conception of both which is the *egge*, containing in it the *virtue* of both *Parents*. So that an *egge* can no more be made without the assistance of the *Cock* and *Henne*, then the *fruit* can be made without the *Trees* aid. And each particular *Individuum*, both *Cock* and *Henne*, seems to be created for the *egges* sake, that the same *Species* may be prolonged, though by the ruine and obsequies of the *Authors*. And it is also clear, that the *Parents* are no longer youthfull, beautifull, complete and *Jovial*, then they can generate, or fructifie their *eggs*, and produce their own like, by the mediation of those *eggs*. Which work of nature so soon as they have accomplished, as if then they had attained the highest *acme*, or Pitch of their perfection, and last end for which they were born, they presently wither, grow old, and *Emerit*, and as if *God* and *Nature* had forsaken them, they decline speedily, and hasten to their end, like creatures weary of their lives. Whereas on the contrary, the *Males* when they arm themselves, and are in all respects well

well appointed for Loves encounter, how strangely doth the potent *Cupid* heighten their enflamed spirits, how spruce are they, how do they pride it; how vigorous, how testy are they, and prone to conflicts! But when this office and performance ceaseth: oh! how soon doth their force abate, and their late fury coole! how doe they hale in all their swelling sails, and check their darings? Nay even while this jocund *Sacrifice* to *Venus* is in season, no sooner is the act performed, but they grow tame and pusillanimous; as if it were then deep printed in their thoughts, that while they impart a life to others, they are in full career to their own urnes. Onely our *Cock*, full fraught with *seed* and *spirits*, approves himselfe the onely cheerefull loser, and with the *plaudit* of his wings and voice, crownes his past triumphs, and lights his wedding Torch at his own Cinders. And yet he also flags after long game, and like an Emerit souldier resigns his Commission. And so the *Hens* likewise, like *Plants* worn out, grow decayed Matrons, and fore-go their Nurseries.

How

How a perfect and fruitfull Egge is produced by Male and Female, according to Aristotle.

EXERCIT. XXIX.

WE have lately said, that an Egge, especially a fruitfull one, is no spontaneous issue; nor doth proceed from any thing but a Hen, nor yet a fruitfull one from her neither, without her intercourse with a Cock: According to that of Aristotle; We are to conclude, that male and female De gen. an. l. 1. c. 2. are the chief principles of Generation: the Male, because he hath the preeminence in the original of the Motus and Generation, the Female in the original of the Matter.

Now according to our decision, A fertile egge is truly a sperme, and genitall seed, Analagous to the seed of Plants, and the first conception resulting from both Parents, and the promiscuous production of them both. For as an Egge cannot have a being without a Hen, so it cannot have secundity without a Cock.

It remaines therefore that we enquire, how the egge is made by the hen, and how it is made fertile by the Cock; for we see that subventaneous egges, and those animate too, are produced by the hen: but yet are not prolificall without the Cock. And therefore both Cock and Hen lay their stock together to constitute a fertile egge. And yet (as I conceive) not in that manner as Aristotle would have it; namely, that the Male should be Master only of the original of the Motus and Generation: and the

the Female onely contribute the Matter. For the contrary appears in Subventaneous egges : And though it be true, where he saith : The Male and Female are different according to reason, because their faculties are diverse, and according to sense, because some of their parts are divers too. The difference between them according to reason consists in this, that the Male is that creature which doth generate in another; the Female is that, which generates in it selfe, and out of which, that which is generated is made, being contained in that which doth generate it. But since these are distinguished by the diversity of the Faculty, and of the Office or employment ; and every performance of an office requires an instrument ; and the parts of the body are commodious instruments to the faculties ; it is necessary that some parts should be accommodated for procreation and Coition ; and that those parts should be different too, that so the Male and Female may be distinguished.

Yet it doth not thence follow, which he seems desirous to infer, saying : The Male is the Efficient, and by the vertue of its Geniture doth produce that which is designed out of the Matter contained in the Female : and the Female doth always contribute the Matter. So that it is necessary that the Female should contribute the Body, and the Quantity or Magnitude, but there is no such thing required at the males hand. Nor is it necessary that the Instruments, or the Efficient it self should be in those things that are produced by them. The Body therefore proceeds from the female, and the soul from the male. For the Substance of the Body is the soul. For an egge, and that an animal one too, is produced by the Hen alone, without the Cock. Whence it appears, that the Female Hen is also the Efficient cause ; and that all power of Production, or the Soul doth not proceed from the

the Male. And this the example urged by Ari-
 stotle seems to confirm: for he saith. Those crea- De gen. an.
l. 2. c. 4.
 tures that proceed to Coition, and are not of the same
 kind (which they do, whose season is alike, and time
 of bearing, together neer at hand, and do not much
 differ in the dimensions of their bodies) do bring forth
 their first issues like to themselves, partaking of the
 Species of both kinds: as those that are begotten by a
 Wolf and a Bitch, or by a Partridge and the Dunghil-
 brood: but in process of time, these diverse Parents,
 produce a diverse issue, the off-spring at length assum-
 ing like form with the Hen, as forraigne Seed is at
 last transformed according to the Nature of the Soile
 where it growes, for the Soile contributes matter and
 body to the Seed.

By which words it is manifest, that in the Ge-
 neration between a Cock-Partridge and a Dunghil-
 Hen, the Male is not the sole efficient, but the Fe-
 male is concerned too: because a Common Spe-
 cies and form, and not that of the Male onely, is
 produced; being alike, both in Body, and Soul,
 as well to the Female as the Male. Now the Soul
 is the Forme and Species of an Animal.

And againe: the Female may seem to have most
 right to the title of Efficient, for he saith, in Pro-
 cess of time, these diverse Parents produce a diverse
 issue, the off-spring at length assuming like form with
 the Hen. As if the Seed of the Male were lesse pow-
 erful; and did in time lose the Species which it
 imprints; as being razed out and expunged by
 a more potent Efficient. And this that instance
 concerning the soile doth more strengthen: For,
 forraigne Seed is at last transformed according to the
 nature of the soile where it growes. By all which it
 seems probable, that the Female is a stronger
 party in Generation, then the Male: For in the

162 *How the perfect and fruitfull Egge* Ex. XXIX.

De gen. an.
l. 1. c. 2.

Universe likewise, the Earth is held to be, as it were, the Female and the Mother: But the Heavens and the Sun, and the other Bodies of that kind, Philosophers call by the name of Father and Genitor. Now the Earth also produceth many things of its own accord, without any Seed: And amongst Animals, some Females do procreate of themselves without a Male; (thus the Henne generates a Subventaneous Egge) but the Male never begetteth any thing without a Female.

Nay by those very Arguments which contend to prove the Male to be the Principle of Generation, and the primary Efficient; the energy or efficiency of the Female seems to be confirmed, and ratified: For that is to be counted the Primary Efficient, in which the reason of the *fetus*, and form of the Production is most eminent; and whose apparent similitude is discovered in the *fetus*, and also which hath an existence it self before, and then generates. Since therefore, the Form, Reason, and Similitude of the *fetus* is no lesse (nay more) in the Female then in the Male; and she also is in being before, as a Primary Mover: We may well conclude, that the Female is as eminent an Efficient of Generation, as the Male.

de gen. an.
l. 2. c. 4.

And though *Aristotle* truly say, that the Conception or egge assumes no part of its body from the Male, but onely its form, species, and soul, and that the Female contributes onely the body, and quantity. Yet it doth no way appear to the contrary, but that the Female doth contribute in some sort both Form, Species, and Soul, (and not the Male singly) As is evident in the *Hen*, which produces Egges without a Male (as the *Trees* beare the Fruits, Herbs and Seed without any distinction of Sexes at all.) And *Aristotle* himself confesseth

that even a Subventaneous Egge hath a Soul. The Female therefore must be the Efficient Cause of the Egge. *Ibid.*

And yet though there be a Soul in the Subventaneous Egge, yet that Soul is not *Prolifical*; and therefore we must acknowledge that the Henne is not properly the Efficient of a Perfect Egge, but that she is so made, by Authority and Commission procured from the Cock. For an Egge, except it be *Prolifical*, cannot justly be said to be Perfect. Now such an Egge is produced onely by the Male; or rather by the Henne, having received such instructions from the Cock; as if from his Coition, the Female did receive the Art, Reason, Forme, Lawes, Rule and Model of the future *Fetus*. Thus the Female (like a fruitful Tree) being made fertile by Coition, is made *Oviparous*, bearing perfect and *Prolifical* Egges. For though the Henne have at present no rudiment of Egges at all ready in the *Ovary*, yet being fructified upon Coition, she suddainly after, both hath, and layes Egges; and those also *Prolifical* ones. And here the experiment of poor Women is of use; *Which having a Fabric.* Hen at home, but never a Cock, they commit her for a pag. 37. day or two to a neighbours Cock: and from that small communication, all her egges succeed fruitful, for all that reason.

That is, not onely those Egges, which now are *Tolks*, and onely want a *White*, or else have some Rudiment of their future growth, though ever so litle; but even those Egges also which are not yet begun at all, and are to be conceived a great while hence, are all rendered fruitful by the same vertue.

The Benefit of this Disquisition concerning Fecundity.

EXERCIT. XXX.

THE Disquisition wherein we examine, What it is in the Egge that renders it fruitful? is very subtle, and difficult, and of exceeding great use: As also what is in the Conception, what in the Seed, and what in the Hen that confers Fecundity upon them: Likewise what in the Cock distinguisheth him from a barren cock? Is it the same cause, which we call the Soule in the *Fetus* or some part of the *Vegetative Soul*? For the knowledge of the First Cause conduceth much to the compleat science of Generation: For Science springs from *Known Causes*, especially those that are the *first Causes*. Nor is this indagation lesse useful to the knowledge of the Nature of the Soul. But when once the verity of this is thoroughly discovered, not onely *Aristotles* opinion concerning the Causes of Generation is refuted, and chastised; but even those things also which Physitians have written against him, are easily disproved. Our *Quere* therefore is, whether that which affords the Fertility to the Egge, Yolk, *Papula*, or *Whelke*, Cock, Hen, and to its Womb, be one and the same thing, or diverse? Likewise whether it be a Substance from whence this vertue flowes? For it seems to be susceptible of Powers, Faculties, and Accidents. Or whether it be also a Corporeal thing? For that seems to be mixt it self, which generates a mixt thing; namely a similitude common to both Cock and Hen; such as is that ambiguous Species produced by a *Cock-Pheasant* and a *Dung-bird*.

Ex. XXX. concerning Fecundity.

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Hen. It seems also to be a Corporeal thing, which suffers from without; in so much that it doth not onely produce feeble *issues*, but deformed also, and sickly ones, and such as are obnoxious to, and do inherit the Virtues, and Vices of their Parents.

We may also make a question concerning each particular, whether that which confers the Fertility, be ingenerated, or comes from without? Namely, whether it be transferred from the Egge to the Chicken; from the Hen to the Egge, and from the Cock to the Hen. For it seemes to be a thing *ex Traduce*; namely, which is transferred from the Cock to the Hen; and from Her to the Egge, the Womb, and the Ovary: From the Seed to the Plant, and back again from the Plant to the Seed. For this is common to all things that are perpetuated by Generation; namely, that their first rise should result from Seed. Now the Seed, the Conception, and the Egge are all of one and the same kinde, and that which renders these Fruitful, is in all of them the same thing, or something of a like nature; and that is some divine thing, and hath an analogy to the Heavens, to Art, Intellect, and Providence. As is plain by the wonderful operations, artifice and counsel of those creatures, in whom nothing is constituted in vain, rashly, or by chance, but all for some Good, and to some End. We shall hereafter be more ample, concerning the Universal Speculation, and knowledge of this thing: Having already spoken as far as occasion hath presented it self to discourse of it by the by, in order to the *Hen-Egge*. Namely, how many things is that thing in, which brings Fecundity? and how is it in them? whether as an Accident, as either an Affection, a Habit, a Power,

or a Faculty ? or as a Forme, and a Substance, or as a thing Contained in a thing Containing, or as a thing reserved in some peculiar part ? For it is most certain, that the very *Subventaneous* egge is compleat in all parts as far as sense can discover, and yet it is Barren : and likewise, that the *Viers*, and also the Hen are perfect, and so is the Cock ; and yet they all were barren, were they deprived of that which conveys their Fecundity to them. All which we shall relate, after we have expounded, What, and How, the two *Principles*, Male and Female, do confer to the Egge, and to Generation ; and likewise in what manner they may both be called the *Efficient Causes* and *Parents* of the egge.

*That the Egge doth not proceed from
the Cock and Henne, after that
manner which Aristotle
would designe.*

EXERCIT. XXXI.

IT is most certain, that the *Fertile Egge* cannot be made, but by both Cock and Hen : and yet not in that fashion as *Aristotle* thought, as if forsooth, the Cock alone were the prime *Efficient*, and the Hen did contribute nothing but the *Stuff*, or *Materials*.

de gen. an. For I am not of his mind, where he saith :
l. 1. c. 4. *When the Seed of the Male enters into the Womb of the Female,*

female, it doth reduce the purest part of the Excrement into a consistence: and a little after. But when the excrement of the Female is in the Womb, it is made by the Geniture of the Male, like to coagulated Milk, for that Coagulum is Milk containing vital Heat, which carrieth parts that are alike, the same way together, uniting, and joining them. Now the Geniture becometh it self just so towards the Menstrua, or excrement. For the nature of the Menstrua and of Milk is the same. Therefore the parts being gathered together, the corpulent humour is discarded, and upon the refraction of the more earthy part, the Membranes resist to encompass the whole; and this upon necessity, and to some intent and use besides. And these things proceed in the same manner, as well in all Oviparous, as Viviparous Animals.

But the matter is much otherwise, in the generation of the Egge. For the Seed (or Geniture rather) proceeding from the Male in Coition, can by no means enter the Womb. Nor hath the Hen after Conception, any excrementitious substance, or purer part of any such substance, or any Blood at all in the Cavity of the Womb, which might receive perfection from the Geniture of the Male. Nor are the Parts of the Egge (namely the membranes and the Liquors) procured by any kind of Coagulation; nor is there found any thing like Coagulated Milk, as is clear and evident out of what hath passed. And hence it follows, that neither the Conception (out of which the Animal springs, as out of Fertile Seed) is after that manner as Aristotle imagined: For the Conception is after the same manner in Viviparous, as the Egge is produced in Oviparous creatures: as himselfe confesses, and shall anon appear in some of our Observations. For it is a certain truth, that the

EGGE, be it barren, or fertile, is made and formed by the Hen alone: onely the fertility indeed is derived from the Cock. I positively affirme, that the Cock conferres neither Matter nor Form to the Egge; but onely that thing by which the Egge is Fertile, and made fit and capable to produce a Chicken. And this Faculty the Cock imparts by his *Geniture*, discharged in *Coition*; not onely to the Egge which is then begun, or already made, but to the *Womb* also, and the *Ovary*, and likewise to the Hen her self: and that after such a manner, that the egges which are yet to come (of which there is now no particle in being either in the *Ovary*, or any other part of the *Body*) shall have the happinesse to be fruitful by it.

Nor after that manner which *Physicians* phansie.

E X E R. XXXII.

THE *Conception* according to the opinion of *Physicians* is thus: In *Coition* the *Male* and *Female* being both delighted, do eject their *Geniture*, or *Seed* into the *Cavity* of the *Womb*; and there their united stock or contribution is mingled together; obtaining from both the *potentiality* of *Matter*, and the *activity* or force of the *Efficient cause*. And that so it comes to passe, as the *Geniture* of this or that Parent shall get the upper hand, the *conception* proves either *Male* or *Female*. And they farther suppose, that immediately after *Coition* (the

Active

Active and Passive ingredients now cooperating together) something of the Conception is put in hand, and begun.

They still affirming, contrary to those who side with *Aristotle*, that the Male is no more the Efficient cause of *Generation*, then the Female, but something compounded of them both : & likewise, that neither the *Menstruous Blood*, nor the purest part of it; but the Sperm it self is the first Matter of the Conception : and upon this ground, they call the first ground-works, or first parts of the Conception, *Spermatical Parts*; which are afterwards to be nourished and supplied by *Blood*.

But the thing is plain, that this also is not the manner, by which the *egge* is produced by the *Cock* and *Henne*. For the *Hen* doth emit no Seed at all in *Coition*, out of which the *egge* may be framed : nay more then this, there is no part of her Seed to be any where found : for she is quite destitute of all parts necessary to the *Generation* of Seed; namely, of *Testicles*, and *Spermatical Vessels*. For though the *Hen* hath an Efficient power together with the *Cock*, (as appears by our former discourse) and that power which renders the *egge* fertile, be in some sort a *mixt power*; yet this proceeds not from the over-ruling force of the *Genitures*, or from the manner of their *mixture* : for it is very certain (and *Fabricius* confesses it) that the *Cocks Seed* enters not into the *Cavity* of the *Womb* : nor is there any particle of the *egge* made in the *Womb* presently upon *Coition*; though *Aristotle* generally affirms there is, (saying, that *some part of the Conception doth forthwith insue*) Nay I shall demonstrate hereafter, that this commixture of Seeds doth never obtain in any Animal whatsoever; and that presently after *Coition* (though it succeed and

be

be fruitful) there is no particle of Seed, or Blood of any begun or attempted Conception, really in the *Womb*, or to be found there. Nor is there in truth any thing to be discerned, in the Conception or Egge, that may any ways argue the Seed of the Male to be contained, or mingled in it. The Common people indeed do falsely conceive, that the *Chulazæ* are the Cocks Seed: and I much wonder, that since there are two of them (in each extremity of the egge, one,) that no man hath hitherto fondly pronounced, that the one was the Cocks and the other the Hens Seed. But this popular error is soon blown over; for the *Chulazæ* are in like manner found, both in the *Subventaneom*, and Fertile egges.

*That both the Male and Female, are
the Efficientes of Generation.*

EXERCIT. XXXIII.

THE *Physitians* do rightly maintain against the *Aristotelians*, that both Sexes participate of the Efficient power; because that which is generated, is a thing compounded of them both: for it is mixt of them both, in the figure and similitude of the Body, and in the Species too; as suppose it a thing mixt between a *Partridge-Cock* and a *Dunghil-Hen*. And it is very consonant to reason, for a man to conceive, that those are the Efficient causes of a Conception, whose com-mixture that which is produced, doth represent and express.

Efficient causes of Generation. Ex. XXXIII. 17.

And this is *Aristotles* opinion. In some creatures, *Metaphys.* which he, it is apparent that, that which generates is l. 7. c. 8. such like, as that which is generated: and yet not the same, not that very numerical thing, but of the same species, as in natural productions. For a Man begets a man, unless something befall preternatural; as when a Horse begets a Mule, and the like. For that which is common to a Horse and an Ass, is not called Propinquissimum genus, the Next Kind: and yet they two may be commixed in one, for such is a Mule. And in the same place he saith; The Generant is sufficient to generate, and be the cause of the existence of the Species in the matter: but such a Species being now in such particular flesh and Bones, is now several persons, as Callias, and Socrates are.

Wherefore since such an entire forme, as namely of a Mule, is mixt of both; namely, Horse and Ass: the Horse alone is not sufficient to produce this form of a Mule in the Matter; but as the whole entire form is mixt, so another efficient cause must be conferred and joynd to it from the Ass. That therefore that doth produce a Mule mixed of both, must be it self adequate, and mixed too, if it be Univocal. As for example. This Man and that Woman, do beget this Socrates; not under the capacity of being both of them *Homines*, Men, and so are of one and the same species; but by reason, that this particular Man, and that particular Woman, are of humane kind, composed of this and that particular flesh, and bones: of both which since Socrates is a kind of Mixture, and is mingled of them both; that of which Socrates is made, must needs be as it were a compounded Univocal mixt thing; that is to say, the mixt Efficient of a mixt Effect. And therefore the Male and Female, are not generative apart, but as they are united in

coition

Coition, and made, as it were, one entire *Animal*; and thence from them both, as from one, the true *efficient immediate cause* of the *Conception* doth result, and is deduced.

The *Physitians* also, while they, minding onely what befalls *humane kind*, give resolutions at large concerning *Generation* in general; and it seeming probable to them, that the *Geniture* flowing in *Coition* from both *Parents*, is the true *Sperme* or *Seed*, proportionable to the *Seed* of *Plants*; do not without reason constitute that mixture which is the *next efficient cause* of the future *Fætus*, out of the mixture of the *Seed* of both *Parents*: and therefore affirme, that such a mixt body is contained in the *Womb* presently upon *Coition*, and is the first *Conception*. But our precedent *History* makes it appear, that the thing is clean otherwise in an *Egge* (which is a true *Conception*.)

*Concerning the Matter of the Egge,
contrary to Physitians and A-
ristotelians.*

E X E R C I T. XXXIV.

THAT which *Physitians* deny in opposition to the *Aristotelians*, namely that the *Blood* is the First Matter of the *Conception*, doth evidently appear out of the *Generation* of the *Egge*. For there is no *Blood* at all contained in the *Womb* of the *Hen*, either in *Coition*, or before, or after it:

Nor

Nor are the Rudiments of the Egge sanguine, but white. And many living Creatures conceive, in whose *Genitals* (if you open them nimbly) not one drop of *Blood* is to be seen.

But while they contend, that the *Mothers Blood* is the Nutriment of the *Fetus* in the *Womb*, especially of the *Partes Sanguineae*, the bloody parts (as they call them) and that the *Fetus* at first, as if it were a part of the Mother, is sustained by her *blood*, and quickened by her *spirits*: in so much that the *Heart* beats not, and the *Liver* sanguifies not; nor any part of the *fetus* doth execute any publick function; but all of them make *Holy-day* and lie idle; in this Experience it selfe confutes them. For the *Chicken* in the *egge* enjoys his own *Blood*, which is bred of the liquors contained within the *egge*; and his *Heart* hath its motion from the very beginning: and he borroweth nothing, either *blood*, or *spirits*, from the *Hen*, towards the Constitution either of the *Sanguineous* parts, or *Plumes*; as those that strictly observe it may plainly perceive. And I make no question, fully to demonstrate in my succeeding Observations, that the *fetus* of *Viviparous* creatures, while they are yet imprisoned in the *Womb*, are no way sustained by the *Mothers blood*, nor vegetated by her *spirits*, but do rejoyce in their own *Soules* and indowments, (as the *Chicken* uses to do in the *egg*) and sate themselves from their owne stocke of *Blood*.

But as for that which concerns the Matter of the *fetus*, arising from *Male* and *Female*, and that so magnified manner of Generation, so much countenanced by the confident *Schools* (namely, that the *Conception* is rendered *prolificall* from the commixture of the *Genitures*, and their mutual *Action* and

and *Passion*) as also those other Heresies of theirs concerning the *Seed of Females*, and concerning the division of *Parts* into *Spermatical*, and *Sanguineous*; many, and those very remarkable and excellent observations, which shall be treated hereafter, have compelled me to dissent from them. I shall at present say onely this, that I tremendously wonder, how *Physitians* (especially such as are skilfull *Anatomists*) should prop up their opinion upon two arguments, as most invincible when those very arguments, if rightly understood do make against them rather.

As for Instance. From that *Concussion*, *Solution* and *Profusion* of Humour (which befalls Women many times with delight, in *Coition*) they conclude that all Women do emit a *Semen* in *Coition*, and that that *Semen* is necessary to *Generation*. Whereas, as, to passe by this reply, namely, that the *Females* of all *Animals*, nay all *Women* have not such a *Profusion*; and that it is no way necessary that the *Conception* must be frustrate without it: (for I know many *Women* that are Mothers without it, and some also, which upon having it, were indeed much affected with enjoyment, but came much short of their former fruitfulness: Besides infinite and innumerable examples of *Women*, who though they receive much satisfaction by their *Husbands*, do yet emit nothing, but do conceive how ever) But I most admire that those, who count this *Emission* necessary to *Propagation*, did not mind how that humour is ejected clean out, and lost for the most part neer the *Clitoris*, and out of the *Secrets*; but is seldom admitted into the *Uterus*, and never into the *Uterus*, that so it may be mixt with the *Sperma* of the *Male*; and that it is also of an *Ichorous*, and *Serous* consistence,

is, and not so Compact and Unctuous as
Geniture, which the very touch denoteth.

Now wherefore should that be excluded out of
ours, which is of so great consequence within?
That humour, under pretence of departure,
is thrown out to the utmost approaches of the U-
terus, that so it may be recalled again with the
water bounty and favour?

Another Argument they erect upon the *Sperma-
tical Organs of Women*; namely, the *Testiculi*, and
the *Spermatical preparing, and leading Vessels*, which
are supposed to conduce to the Generation of the
male.

But for my part I wonder much, how they fan-
tasy, that so elaborate, concocted, and quickening
and *men*, can arise from so imperfect and obscure
organs, so that, that of theirs (when the controver-
sies concerning the preeminence and overruling
power is in debate; namely, whether the *Males* or
the *Females* commands in chief, and which of the two
is to be reputed the *Efficient*, or *Agent*, or the *Mat-
ter*, or *Patient*) should exceed the *Males* in power,
in-virtue, and generative ability; and should sub-
vert the *Males* seed under it, inforcing it to submit
itself to supply the place of the *Material Cause*,
where notwithstanding it is digested by so quick & active
heat, refined in such variety of *Vessels*, and dar-
ring it self with so much activity. But of these
more hereafter.

In the mean time it is most certain, that the
un-egge is generated by no such conjugal *Profu-
sion*: though the Mother after recreation (as one
wished with delight) shakes her feathers for joy,
and as if she grew proud from the Boone she recei-
ved, composeth and rectifieth all her extravagant
humours: like one that adored the deity for the
grand

grand benediction of multiplying issues. The *Pigeon* (especially that kind of *Pigeon* which is transported hither out of *Africa*) expresseth wonderful content from the enioyment of her Male, leaping, and spreading her taile, and sweeping the low earth with the bristles of it, and then combing and rectifying her Plumes with her Bill; as though she deemed nothing comparable to the blessing of fertility.

We have said before, that the first matter of the *EGGE* is not formed of Blood, as *Aristotle* thought, nor yet as the *Physitians* conjecture, out of the commixture of the Males and Females *Geniture*. But from whence we do derive it, is partly already shewen in our *History*, and shall be more largely explained hereafter, when we treat in generall of the matter which doth constitute every *fructus*.

How far the Henne is an Efficient Cause in the Generation of the EGGE, according to Aristotle: and why the assistance of the Male is required.

EXER. XXXV.

WE have already proved the *Cock* and *Henne* to be the two Principles of Generation in regard of the *EGGE*, though we are otherwise persuaded of the manner how it comes to passe, thus *Aristotle*

Aristotle and *Physitians* are. For we have made it manifest out of the generation of the *Egge*, that the *Hen* as well as the *Cock* is an *efficient cause*, and hath in her a *principle* from whence the *mutation* proceeds, and also a constituting faculty: though in *Coition*, neither the *Cock* doth confer matter to the *Egge*, nor doth any profusion of seed result from the *Hen*, by which the *Egg* should arise. It is therefore evident, that *nature* (amongst some animals at least) did not therefore institute a distinction of *Sexes*; that the one (as an *Agent*) should contribute the *form*, and the other (as the *Patient*) the *matter*, as *Aristotle* did conceive: nor that a *semen* should result from both in *coition*, that about of the mixture of them, a *Conception*, or *Egg* should be framed, as *Physitians* imagine.

Now since these two opinions doe comprehend the whole Legend of *Antiquity*, concerning the causes and principles of *Generation*: it appears that all men were hitherto ignorant of the reason, both why the *female* doth not generate alone by her selfe (as *Plants* doe) but requires the association of the *male*: and also how the *conception*, or *egg* is procreated both by *male* and *female* thus conjoyned: and likewise in what either of them conduce to the work, and to what end and purpose *coition* was instituted.

Aristotle, contrary to his own universal Hypothesis (namely, That the male is the *Agent*, and the female only for the matters sake) perceiving the egg proceed from the *Hen* without any help of the *Cock* at all, was enforced to subscribe, that the *female* also is an *efficient cause*: and that the *Egge*, when it is excluded, doth conserve, nourish, and augment it selfe, and produce a *fatus* out of it: (as the *egges*, or spawn of *fishes* doe) and

N

there-

de gen. an.
l. 3. c. 7.

therefore he concludes, that there is also a soule even in a subventaneous, barren egg. And how far forth the Female is an Efficient, and also a subventaneous egg informed by a soule, he attempts to explain, where he saith. Subventaneous eggs admit Generation as far as they may; but that they should be compleated to the very fecundity of an Animal, is quite impossible; for to that a sensitive soule is required. But even females, and all things that live at all do obtain the vegetative faculty of the soule, as hath bin often repeated. And therefore this barren egg considered as the conception of a Plant, is compleat, but considered as an Animals, it is incomplete. By which words he seems to content, that the Vegetative soule is also in the very subventaneous egg, because that soule is in all living things; now an egge doth live. He also allowes the Hen a creating Prerogative, and a power of inducing a Vegetative soule: because all females have that privilege: and therefore a subventaneous egge considered under the capacity of a Plant, and living as that doth, is stiled a perfect conception, but under the rank of Animals, an imperfect one. As if the male were no whit requisite to the being of the perfect conception or egge, but onely that out of that egg an Animal might proceed: Not to the complement of the egge, in order to a requisite relating to its own perfection (for the conceptions of plants themselves are in this sense compleat) but that it may be endowed with an Animal principle. So then, the Egg is made by the Hen, but is made prolificall by the Cock. Aristotle in the same place goes on: In all the Genealogies of Birds, there is a male and a female; so that a Hen may make her conception perfect, as a Plant, though it be unaltered by coition: but as an Animal, she

perfect it ; nor can she empower it to produce any other thing out of it. Nor is it rendred as the fruit of a Plant simply, nor as of an Animal, by coition. He speaks of a subventaneous egg : and addes further : that those eggs which are conceived by coition, and are now discovered to have obtained some portion of the Male, they becom fruitful by virtue of that Cock who is first concerned in coition ; for they are now furnished with both Principles.

Whereby he seems to confess, that the Female also is an Efficient in Generation, or hath a generative power ; because every female hath a vegetative soule. now generation is a faculty of the vegetative soule. And upon this ground, when he propounds the difference between the male and female, he even there owns them to be Generative both : for he saith, *We call that animal the male, which begets or generates in another, and that the female, which generates in it self.* And therefore according to Him, both doe Generate ; and as there is in both a vegetative soule, so is there in both a generative power. But how these differ, hath been said before in the History of the Egge. Namely the Hen, alone by her self, without any assistance of the Cock, Generates a subventaneous egg, (as plants do from themselves produce a fruit) but she cannot produce a fertile egge, without either antecedent, or subsequent Coition of the Cock. The female doth generate, but it is only in some measure ; and the males coition is required, that that generative faculty should be perfected in the female : that so she may not only bring forth an egg, but such an egge that may produce a chicken. For this defect in the females generation, the Male seems to have been created (as shall hereafter appear) that so what the female cannot

180 *A perfect hen-eg hath two colors. Ex. XXXVI.*
compleat alone, (namely the *seed*, or *fertile-egge*)
that the *male* should supply by *coition*; wherein
he doth impart that power either to the *Hen*, or
the *Egge*.

*A perfect Henne-egge hath
two Colours.*

EXERCIT. XXXVI.

pag. 10.

All eggs therefore are not *perfect eggs*; but
some are reputed *imperfect*, because they have
not yet attained their just magnitude, which they
afterwards doe receive abroad: And others, be-
cause they are yet *improlific*, and afterward
doe borrow a *prolific* power from without; as
Fishes eggs, or the *spawn* of fishes. Other eggs al-
so, are by *Aristotle* counted *imperfect*, because they
are of *one colour* onely; but those that are of
two colours, *perfect*, as being constituted of a *Yell*
and *White*: which are conceived to be more dis-
tinct, better concocted, and endowed with more
heat. And therefore those that are called *One*
Centenina, which *Fabricius* conceits to be onely
constituted of the *Reliques* and *Remainders* of
the *White*, are only of one colour, and reputed
imperfect, because of the defect of their heat, and
their own imbecillity. But amongst all the eggs
that are, there is none more *perfect* then the *Henne-egge*
which is still produced perfect, and adorned with

Ex. XXXVI. A perfect hen-eg hath two colors. 181

all its liquors and accoutrements, and of a convenient and just magnitude.

Now Aristotle gives this reason why it comes to pass that some Eggs are of two colours, and others of one only : because, saith He, in hotter Animals those things out of which the rudiments of Generation, and those out of which the Aliment is derived, are always distinct and apart : and of them one is white, and the other yellow. As if the Chicken took its life from the White, and were onely fed by the Yolk. And in the same place he saith. That part of it which is hot, doth more resemble the complexion of the parts that are to be made ; but that which is the more terrene part, affords onely supply to the body, and keeps at greater distance from it. And therefore in eggs that have two colours, the Animal assumes its beginning from the White. For the Animal rudiment is in the White, and the nourishment is derived from the Yolk. Therefore we see his opinion is, that the foresaid Liquors are distinct, and that eggs are produced party-coloured.

And these Assertions of his, are partly true, and partly false. For it is false, that the Chicken is made out of the White, and fed by the Yolk. For by our History of the Fabrick of the Chicken, both from the dissemination of the Umbilical Vessels, and the distribution of their propagations, which without all question doe serve for the attraction of the Aliment, it is most manifest that both the constituting matter and the Aliment, are from the first original supplied both from the yolk and white ; for some part of both these liquors doth melt and dissolve. And also the Macula, by whose first dilatation the Colliquamentum is made, which is also stiled by us the Oculum, or Eye of the

De gen. an.
l. 3. c. 1.

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182 *A perfect hen-egg hath two colors.* Ex. XXXVI.

EGGE, is plainly seen to be imprinted into the com of the *Yolk*.

And yet for all this, the distinction of the *egg* into the *yolk* & *white* doth seem to be very necessary: because those two *Liquors*, as they are without all doubt of a diverse nature, so doe they serve to a diverse use. And that is the reason why they are distinct in every perfect *egg*; one of them being the *Aliment* which is next at hand, and the other, that which is farther off: with the one the *fetus* is sustained at its first formation, with the other in succeeding time. For it is most unquestionable (as *Fabricius* affirms truly, and we also shall explain anon) that both the *Yolk* and *White* are the *Aliment* of the chicken, and that the *White* is first spent. Wherefore I agree with *Aristotle* against the *Physicians*, that the *White* is the most sincere, most concocted, and elaborate part of the *EGGE*: and therefore as being the hotter part, it encompasseth the whole circumference of the *egge*, which is yet in the *Wombe*, whilst the *Yolke* as the more terrestrial part doth reside in the Center. For the *White* seemes to containe more plenteous animal heat in it, and therefore to be the neerer and first nourishment. And so also upon the same account, the exterior part of the *White*, seems to be more simple, and better concocted, then the interior.

In that *Physicians* affirme, that the *Yolke* is the hotter part of the *egge*, and most nourishing, I conceive they understand it, in relation to us, as it is become our nourishment, not as if it doth supply more congruous aliment to the chicken in the *EGGE*. And this appeares out of our History of the *Fabrick* of the *Chicken*: which doth first pass upon

upon and devoure the thinner part of the *white*, before the grosser; as if it were more proper diet, and did more easily submit to transmutation into the substance of the future *fetus*. And therefore the *yolk* seems to be a remoter and more differred entertainment then the *white*; for all the *white* is quite and clean spent, before any notable invasion is made upon the *yolk*. Nay, the *yolk* is found in the *Abdomen* of the *Chicken*, even after his exclusion, as if it were reserved for the Infant-*chicken* in stead of *Milk*.

The two-coloured *egges* therefore are most perfect; as being more distinct and wrought up by a more vigorous heat. For since there ought to be measured in the *egge* not onely the matter of the *Chicken*, but his first feeding too: that which is provided for a perfect animal, ought it self to be perfect too; and such is that *egge* which consists of two distinct complexioned parts: whereof the one is the former, and more simple, and therefore of gentler digestion; the other the latter, or more remote, and therefore translated into the substance of the *Chicken* with more difficulty; (now the *yolk* and *white* are thus different amongst themselves) and therefore Perfect *egges* are Party-coloured, compounded of a *white* and *yolk*: as containing and storing up in them several provisions of harder or more friendly digestion, according to the several age and ability of the *Chicken*.

How the Egge is supplied with its White.

EXER. XXXVII.

IT appears by our History that the *primordia* of the eggs in the Ovary are wondrous little, resembling small wheelks, and lesse then the seed of Millet, being full of a white watry moisture : and that these *Papulae*, or wheelks do at length shoot up into yolks, and that those yolks are at last invested and cloathed with a white.

Aristotle seemes to be of opinion, that the white is generated out of the yolk by way of Separation. *de gen. an.* Let us read his words : The Sex, saith he, is not the cause of the party-colours, as if the white did proceed from the Male, and the yolk from the Female ; but both are derived from the female or Hen. But one is hot, and the other cold. And in those creatures that have good store of heat, they are distinguished from one another ; but where that heat is fainter, they are not distinguished. And for that reason the conceptions of such Animals are of one onely colour, as is said. Now the Male seed onely doth constitute the egge : and therefore at first the conception of all Birds is white, and small, but in process of time, it is all yellow, because now a large quantity of blood is admixed ; and lastly, the heat abating, the whiter part environs it round, as being a humor equally tempered on all sides. For the white part of the egge is naturally moist, containing in it an animal warmth, and therefore it is placed about the egge, and the yellow earthy part remains within. *l. 3. c. 1.*

pag. 12.

But Fabricius conceives, The White of the Egge to grow to the yolk by a juxtaposition meerly. For while, saith

With he, the yolk rowleth through the second Uterus, and falls down by degrees, it doth by degrees gather to a part of the White, which is purposely generated in the Uterus, that it may cleave to the yolk; untill the yolk having now passed the intervening or middle lines, and arriving at the last of all; it is together with the White encompassed with the membranes also, and thus assumes a shell. He conceits therefore, that the Egg attaines its increase in a twofold manner; partly by the Veines, as it is with the yolke, and partly by an additional accession or apposition, as it is with the White. And this perhaps did induce him to be of that judgement; namely, because the White being boyled hard, doth easily part and distinguish into flakes, whereof the one lyes above the other. But this also doth befall the yolk not yet departed from the Ovary, if it be hard boyled as the former. And therefore being otherwise instructed by Experience, I rather join in opinion with Aristotle; for the White is not adjoined (as Fabricius would have it) but bred also, and furnished with the Chalazæ, and distinguished by several membranes, and divided into two white liquors: and all this, by the same vegetative soul, by whose industry the Egg it self is distinguished into two liquors, (a yolk and a white.) For every part of the Egg is formed and constituted by the same faculty which frames the whole Egg. Nor is it true, that the yolk is first made, and then the white adjoynd to it. For, what wee see in the Ovary, is not the yolke of an egg, but rather some compound, comprehending both liquors mixed together. It resembles the yolk indeed in complexion, but the white in consistence: for being boyled hard, it is not friable (as the yolk is) but concrete and glutinous, and consisting of several flakes, as the White, and hath as it were

Ibid.

were a white Papula, or whelk in the middle. Aristotle seems to erect this separation from the diverse nature of the yolk and white. For, saith he. If you cast diverse egges into a bason, or such like vessel, and prepare them over a Chafin-dish of coals in such sort, that the force of the fire be not nimble to the distinction of the eggs; the same thing will befall all the heap of eggs, as happens to every particular egg, namely all the yolks will gather and assemble themselves into the middle, and the Whites get round about the yolk.

And this I have often experimented; and, whenever will, may try it: provided, he shake the yolks and whites together, and with a piece of butter digest them temperately into a Cake, having mingled them between two dishes, placed over a Chafin-dish of coales, or in an Oven; for he shall plainly see the whites cover the yolks which are assembled at the bottom.

What the Cock and Henne do confer to the Generation of the Egge.

EXER. XXXVIII.

BOth Cock and Hen are to be reputed the *Parents*; for both of them are necessary principles of the Egge, and both alike Efficient causes. For the Egge it self is the *Henns* work, and the *Fertility* the *Cocks*. Both are therefore Instruments of the *plastick* virtue, by whose meanes the species is continued to the world.

But since in some *Animal* species (as if the Male

are a useles thing, and the Female alone did suffice to the perpetuity of the species) there are no Males to be found at all, but the whole race is female, as in some species there are Males onely, and no Females at all to be found; for they do all by an emission of something out of them into the air, the earth, or water, progenerate, and preserve their species: Nature seemes in these and the like creatures to have satisfied her selfe with one sex onely, using that alone (as an instrument) for procreation.

And now again some other creatures have a seed provided for them, casually as it were, without any distinction of sex at all; namely those creatures whose Birth is spontaneous. For as some things Arist. phys. are the productions of art, and the self same things are l. i. c. i. the issues of chance too, as Health, for one: So likewise some kinde of Animal seed is not simply produced from an univocal Agent (as a Man from a Man) but onely in some sort univocal; (namely in all those creatures whose extract and matter out of which they spring, is casual in relation to them, and yet undergoes a mutation of it selfe, as the seed doth) namely, Those Animals that are not produced by coition, but are born of their own accord, are produced from such an original as Insects be, which breed a worm. For as some Artificers de gen. an. work with their bare hands, but others again use l. 3. c. 9. instruments in all their operations; and the better sort and more excellent Arts do imploy instruments of severall figure and magnitude, to the execution of severall, and especially of the more curious and subtile Operations: (for the more eminent and more laborious works, are made for the most part of severall motions, and doe require severall subordinate productions and ends; & in this thing,

as

as in all other, *Art* is *Natures* Ape, and *Mimick* so in like manner *Nature* doth of necessity set a-work more *instruments*, and those too of divers *faculties* and *abilities*, in the production of the more perfect, and more excellent *Animals*. For the *Sea*, or the *Heavens* (or what ever else is understood to be a common and general Father in the production of *living creatures*) do produce some things by themselves, by chance, and as it were without employing any intermediate *Instrument*, by an *equivocal* generation, and yet beget some onely by an *univocal* procreation: namely all those, that are begotten by some other of the same kinde, which doth contribute both *Matter* and *Form* to them.

And thus in the *Generation* of the most perfect *Animals*, where these *Principles* are distinguished, and these *seeds* of the *Animals* are distinct: the *Male* and *Female* are the two necessary requisite *Instruments* to the production. And in this manner is our *Hen-egg* produced from the *Cock* and *Hen*.

Gen. an. l.
2. c. 3.

The *Henne* generates in her self, and therefore communicates *place*, *materi.alls*, *nourishment*, and *cherishing* to the *conception*; but the *Cock* conveighs *fecundity*: For the *Male*, saith *Aristotle*, doth even complete the *generation*, and causeth a *sensitive soul* to be introduced, and from an *egge* creates an *Animal*.

And therefore proper *Organs* for both *faculties* are dispersed among the *Cocks* and *Hens*. Namely in the *Hen*, all the *Genital parts* are commodious for *reception*, and *containing*; and in the *Cock* for *transferring* and *immission*, or preparing of that thing which doth conveigh *fecundity* to the *Henne*, he being one that generates in another.

Now, having made strict discovery, by *Anatomical dissection*, of the parts sacred to *Generation*, we well know, what both *Male* and *Female* doe conferre

conferre to it. For the knowledge of the *Instruments* doth lead in a straight line, to their *functions* and *uses*.

Some things worthy observation concerning the Cock.

EXERCIT. XXXIX.

THE *cock* (as we have shewed you) is the *Primary Efficient* of the *perfect* or *fertile egge*, and the main cause of *Generation*. For were it not for the *cock*, a *chicken* could never spring from the *Egge*; nor the *Egge* it self have any being in many *Oviparous* creatures. And therefore we must make farther search concerning the *Action* and use of the *cock*, namely what advantage he brings to the *egge*, and the *chicken*, as well by *Coition*, as other offices.

It is evident that the *cock* (though, as I suppose, he wants a *Yard*) doth emit his *Geniture*, commonly called *Seed*, as may be collected from his *Genital Parts*; for the *Testicles* are furnished with it, and there is great abundance of it discoverable in the long and ample *Leading Vessels*. But whether it leap out, capering, and frothy by the activity of the *spirits*, and at several ejections (as in hotter *Viviparous* creatures) I am not yet able to resolve. But because I can finde no *Vesicles* containing the *Geniture*, by which it should be fermented, and dart forth, heightened by the *spirits* into a *Spuma*, or froth: and also finding no *Yard* through

through whose narrower *channel* it being protruded, it might leap, and result, verberating the Interiours of the *Hen*, especially seeing coition in Cocks so soon over; I rather believe, that there is onely a light tincture of *seminal* humour, such as doth onely moisten the Orifice of the *Pudenda*; and that the seed is speedily dislodged without any sprightly exultation: so that, what other *Animals* do ejaculate by several reverberations at one and the same Initiation, Birds (which do not long insist upon venereal undertakings) do expedite by many repeated Coitions. For those creatures that dwell long in venereal offices, do make but seldom repetitions: and such, among Birds, are the *Swan*, and the *Ostrich*: Because the *Cock* therefore cannot stay long in his performances, he doth execute that at several returnes, which other creatures do at several impulses. And though he neither have *Glans*, nor *Penis*, yet the extremity of the *deferent Vessels* growing turgent by *spirits* (in Coition) doth extubérate after the manner of a *Glans*, by which he doth compress the Orifice of the *Uterus* of the *Henne*, it being bared and exposed by the apertion of the *Fundament*; and so bedewing it with genital moisture, he stands in no need of a *Yard* for the immision of his Geniture.

Now, we have shewed you, that the *Cocks Seed* is of so great vertue, that it doth render not the *Uterus* onely, but the *Egge* in the *Uterus*, the *Papula* in the *Ovary*, and lastly the whole *Hen* herself, and all the Rudiments of the *Eggs*, either already in being, or to be produced hereafter, fertile and Prolifical.

And therefore *Fabricius* rightly observed, that more of Geniture was intrusted to the *Testicles*, and
defe-

protruding the want of much of it to fructific each single eggs; that one Cock may approve himself sufficient for his severall Concubines, and repeated performances.

Now the brevity and rectitude of the Cocks spermatical Vessels do conduce to the nimbler discharge of the Seed: for that which travels through long and perplexed Meanders, makes slower passage, and needs a more copious impulsive spirit to quicken its Exit.

Amongst the Males, none more jovial, none more haughty, nor of stiffer garbe, nor more essential in concocting his food, then the Cock, a great part of whose Aliment is transformed into excrement; and therefore Polygamy is convenient for him, as ten or twelve obedient Hens. For in some species of Animals, one single Male can treat a multitude of Females, as we may see Stags, Bucks, and several Cattel: and there are others again where the lusty Female is not satisfied by several Males; as the Bitch, and the Wolf; upon which more Meretrices *Lupa dicuntur*, Prostitutes are called Wolves, and Brothel-houses *Lupanaria*. And again some Creatures are more chaste, and reserve, as it were, a Conjugal integrity: so that one Male keeps faith with one Female, and both proceed veruouously to propagate their kind. For since Nature requires, that the Male should supply the defects of the Female in Generation, and that he alone is not sufficient to sustain, cherish, and defend her issue, the Male is added as a Consort to her, who should joyn in the task of generating, and nurturing the Young. Thus the Partridges enjoy a Conjugal Life, and because their males cannot hatch so many egges at once, nor attend

tend the education when the Young are excluded they are reported to build each of them a Nest. And so the *cock-Pigeon* takes his turnes of *Incubation*, and joynes in the erection and fabrick of his nest, and likewise in laying in provision for his off-spring. And so in like manner you may discover many examples of a Conjugal life among brut beasts, of which more hereafter.

But those Males that serve many Females (as the *cock*) their *Testicles* are much lined with seminal moisture, and they are provided with long and large *deferent Vessels*. And at that time, and age that the cluster in the *Ovary* begins to ripen and become mature, and stands now in need of Fructifying, that the *Papula* may be perfected into *Egges*, the *cocks seed* begins to encrease, and his *Testicles* grow turgent and tumorous, and are also seated in the same place (namely neer the *Diaphragma*) into which they insfil fertility. And this is evident in *fishes*, *birds*, and all other *Oviparous* creatures, whose males are all replenished with seed, at the same time, and place, whereat their females do conceive their egges.

And therefore all those parts of the *Hen* which are designed to *Generation*, namely, the *Ovary*, *Infundibulum*, the process of the *Womb*, and the *Womb* it self, and the *Privities*: and also the *situation*, *fabrick*, *quantity*, and *Temper* of all these, and whatsoever else relates thereto: they are all inservient, and handmaids either to the procreation of the *Egge*, or to its Augmentation, or else to Coition, and fertility received from the Male, or to the *fetus*: to which they conduce either necessarily and principally, or as a *Causa sine qua non*, or some way or other to the better being.

For there is nothing made either vain or rash

all the operations of Nature. So likewise all the Genital parts in the Cock are contrived for preparing or concealing, or else transmitting the geniture of him into the Hen.

But such males as are so vigorous, that they can supply many females, these do much exceed their males in their growth, and stature, as also in their ornaments, courage, and weapons; which is not so eminent in those that are conjugal and chaster. For a cock-Partridge, Crow, or Pigeon, are not so much superiour and different from their consorts, as the Cock is from the Hen, or the Stag from his Hindes.

And therefore the Cock, as he is well appointed in his weapons, brave in his plumes, haughty, and ambitious, valiant, and a famous Duellist; so he also abound in Seed, and is swift in his chamber-offices, and of so unbounded a luxury, that (except he have his Seraglio for his concubines) he will tire out his wives by frequent invitations, and compressions, and (as we have observed in the Pheasant, the Turkey-cock, and others) will cruelly handle them, with unseasonable advancings, which and molestations. I have seen Hens sometimes tired and torn by the insolency and incivility of the insatiate Cock, that all their backs have been deplumed, and they themselves by deep excoriation, piercings to the bare bone, have miserably expired.

O

of

Of the Henne.

EXER. XL.

THere are two first *Causes* and *Instruments* of *Generation*, the *Male* and *Female*. For the *Hen* seems to be the *Author* of the *EGGE*, as the *Cock* is the *Fertility*: and therefore by the *coition* of these two, that which renders the *egge* fruitful, is transferred from the *Male* into the *Female*, or generated in the *Female* by that *coition*.

But what that is, is no less difficult to be known, then to what it is communicated: namely, whether to the whole *Henne*, or to its *Uterus*, or to the *Eggs* already made, or else to all the *Eggs* now begun in the *Ovary*, or to be begun hereafter? For it is probable, according to our former discourse, and also by *Fabricius* his experiment, that a few *coitions*, and the commerce of the *Henne* with the *Cock* for a few days, doth sufficiently fructify her, or her *womb* at least, for a whole year together. And I my self, informed by experience, can partly affirm the same thing; namely, that the twentieth *egge* layed by the *Hen* (after her divorce from the *Cock*) hath been fruitful, and prolificall. That from the *geniture* of the *Male-fishes* scattered in the *water*, a great family of *eggs* is endowed with prolificall virtue; and as in *Bitches*, and *Sowes*, and also other *Animals*, some few *coitions* have satisfied to the fertility of several *fetuses*: (insomuch that some think it an approved Maxim, that in case a *Bitch* be oftner compassed by the *dog* then three or four times, it will wrong her fertility, and make her births degenerate most into females)

Also the Cock by some few familiarities with the Hen, doth not only render the egge now being in the Ovary, but the entire Ovary, and Hen her self prolificall (as hath been often repeated.) Nay, what is more then this, and admirable indeed; In a certain part of Persia (saith Aristotle) if you cut up a Mouse, you shall finde even the young ones within, that are females, to be great with young themselves: being made mothers before they are born: as if the male did not onely fructifie his female, but all the females also of which she labours; as our Cock doth not only render his henne fruitful, but all the eggs also that she is to lay.

Now this Physicians do confidently deny, who affirme the conceptions of Animals to be produced by the mixed geniture of both Sexes. And therefore Fabricius, though he pronounce the Cocks seed never to enter, nor to have any possibility of entrance into the hollow of the womb, (where either the egge is made, or increased) and though he plainly saw, the egges now newly begun in the Ovary, to be made fertile by the same coition, as well as those egges which were already made; yet he will needs have the Cocks seed, if its presence and continuance were absolute necessary) to be locked up for a whole year together in the pouch of a prolificall Hen, and there to be reserved in a blinde chink. Which perswasion we have formerly rejected, and that because that cavity is indifferently found as well in a Cock, as in a Hen; and also for that we could never discover such a standing pool of Geniture, either in that cavity, or any other cranny in a Hen: but as soon as the Geniture hath delivered her message, she hath performed her trust, by imprinting a prolificall

pag. 381
39.

Arist.
de gen. an.
l. 2. c. 3.

Ibid.

virtue in the *Hen*, it either retires back again, or is dissolved, and rarified into air, and so vanisheth. And though *Galen*, and all *Physitians* with him, do strongly oppose this dissolution of the *Geniture*, yet having thoroughly considered the *fabrick* of the *genital part* by *Anatomical-administrations*, and having likewise pondered other most invincible arguments, they must necessarily acknowledge, that the *seed* of the *male*, as it is derived from the *Testicles* by the *leading vessels*, and contained in the *spermatical vessels*, is not *prolific*, unless by the fervency of *Coition*, and desire, it becomie *aerial*, and rarified into a *spume*. For (witness *Aristotle*) it is not the corpulency of the *seed*, or its *fire*, that renders it *prolific*, or any quality like to those, but the *spirit* which is inclosed in the *seed* and *spumous body*, and the *nature* which is in that *spirit*, being answerable and like in proportion to the *Element* or *substance* of the *Stars*. Wherefore, though we should indulge *Fabricius* in his opinion, that the *Seed* is reserved in that *pouch*; yet notwithstanding, after the *prolific* effervency, or the *spirit* is resolved, it would grow useles, and *improlific*. And from hence may *Physitians* take notice, that the *geniture* of the *male* is not therefore the *architect* of the *fetus*, because the first *conception* assumes its body from it, but because it is *spirituous*, and boyling, as being inspired with a *fertile spirit*, and turgent like a thing possessed. For otherwise *Averrhoes* his fable, of the woman that conceived in a *Bath*, might have some title to true story. But of these things more in their proper place.

As therefore the *Egg* is made by the *Hen*, so is it also very likely that all the first *conceptions* (as shall be shown hereafter) doe assume both their *Matter* and *Form* from the *female*; and that also

After the *males geniture* is immitted, and now for some time quite departed and vanished away. For the *Cock* doth not conferre any *fertility* to the *Hens Eggs*, by the bare emission of his *geniture*; but only so farre forth as that *geniture* is *prolificall*, and impowered with a *plastical virtue*; that is to say, *spiritous, operative, and proportionable to the substance of the Stars*. The *male* therefore is no more to be prized as the chief principle of the *conception*, and *fecundus*, by reason he can concoct and emit seed, when a *female*, which can produce an egg without his help. But he therefore rather claims prerogative, in that he impowers his seed with *spirit*, and divine efficacy; and so, that in a moment it can perform its affaires, and convey *fertility*. For as we see things immediately set on fire, and inflamed by a spark struck from a *flint*, or by a flash of *Lightning* from a *cloud*; so the *geniture* of the *male* doth immediately affect the *female* with the touch, and transferres *fruitfulness* unto her, which doth not only virtuate the *eggs*, but the *womb* also, and the *Hen* herself, and all in an instant: for so combustible substance is sooner set on fire by the approach of the flames, then the *Hen* is made pregnant by the *contion* of the *Cock*.

But what it is that is transferred from him to her, we shall have occasion to discover in its order, when we shall determine the matter more perspicuously and in general.

In the mean time we must take notice, that if it be derived from the soul (for it is most likely that whatsoever is *fruitfull*, the same is also animate, and we have said before, that an *Egg* in *Aristotles* opinion is indowed with a *vegetative soul*, as also all the seed of *Plants*) that soul (at least the *vegetative*) must of necessity be *ex traduce*, and derived

from the *Male* into the *Female*, from the *Female* into the *Egge*, and from the *Egg* into the *Fetus*; or be ingenerated in each of them successively, by the *contagium*, or contact of coition.

de gen. an.
l. 3. c. 1.

Yet neverthelesse the disquisition seems full of ambiguity: and therefore though *Aristotle* grant, the *Geniture* of the *Male* to be of so great a vertue, that being but once onely infused, it sufficeth to the fertility of many *Egges*; yet least repeated coition might seem vain, he saith, In *Birds* those very *egges* that are produced by coition, cannot for the greater part encrease and grow, except coition be continued to the *Bird*. And the reason is, because as in *Women* the *Menstruous* excrement is attracted by the Coition of the *Male* (for the *Womb* being heated, doth attract, and the passages are opened) so is it in *Birds*, while the *Menstruous* Excrement comes down by degrees, which cannot get out, because it is but little in quantity, and is retained above, about the *Diaphragma*, but falleth into the *Womb* it self. For this is that which augments the *Egg*, as that which floweth by the *Navel*, augmenteth the *Fetus* of *Viviparous* Animals. For when once *Birds* have bin at Tread, they persist to have almost all their *Eggs*, but those very small. So far perhaps *Aristotle* may be in the right, that repeated Coitions may procure more, & fairer *Eggs*, because more plenty of Matter may flow to the *Womb* (by its being tepified by coition) but yet it is not necessary to the Prolification of the *Eggs*, that the coition should be often repeated.

For experience declares the contrary, and the reason which he alleages, doth no way inforce it: for the Rudiment of *Eggs* is not derived from *Menstruous* Blood (which indeed is no where to be found in a *Hen*) but *egges* are generated in the *Ovary* (where there is no preexistent blood at all) as well with-

without the cocks treading, as with it.
 The Hen (as all other Females) administers
 Water, Nutriment, and place to her conception.
 Now the Matter from whence the Rudiment of all
 the Eggs in the Ovary doth spring, and increase,
 seems to be the very same with that out of which
 all the other parts of the Hen are nourished, and
 grow, namely the flesh, nerves, bones, also the head,
 and the rest of the members. For Aliment is con-
 veyed to every Papula or Whelke in the Ovary (af-
 ter the same manner as to the other parts of the
 Hen, namely, by the Vessels: and the place where
 the egg is divided by Membranes, and perfected
 by the Grandines, and the shell, is the Uterus,
 or Womb.

But that neither the Hen doth emit any Seed in
 coition, nor poure forth any blood at that time in-
 to the cavity of the Uterus; as also that the egge
 is not formed after *Aristotles* way; nor yet (as *Phy-
 sicians* suppose) by the commixture of Seeds, and
 likewise that the Cocks seed doth not penetrate in-
 to the hollow of the womb, nor yet is attracted thi-
 ther, is most manifest, from this one Observation,
 namely, That after coition there is nothing at all to be
 found in the Uterus, more then there was before. Which
 thing, when it shall anon evidently be proved, and
 when we shall also have demonstrated, that it is
 true likewise in all the kinds of Animals which
 bring forth young, it will then also be as evident
 that all those things which have hitherto been de-
 livered to us from all Antiquity, concerning the
 Generation of Animals, are erroneous: and that
 the *fœtus* is neither made of the Seed of Male or
 Female, nor of the mixture arising from them
 both, nor yet of the Menstruous Blood: but the
 thing is one and the same in all creatures (as well

in a *Prolificall* Conception as after it) as it is in the Generation of the Chicken out of the Eggs, and just in that manner as *Plants* do spring from seeds of their own kind. For it doth not appear that the Male is required, to the intent that hee should be as an Agent, Operatour, or Efficient *per se*, nor that the Female, is required that she should contribute the matter; but both Male and Female are to be esteemed in some sort the Operatour, and Parent: and the *fetus* is procreated a mixt similitude, and resemblance, as if it proceeded from both mixt together. Nor is it true which *Aristot'e* often affirms, and *Physitians* take for granted, namely, that presently after Coition, there is something to be found of the *fetus*, or conception, (as the *Heart*, or the *Ties Bullæ*, or some other Principle part) or something at least in the cavity of the Womb, as some *Coagulum*, or *Spermatical* mixt substance, or the like. But on the contrary, in case the Female prove fertile, and pregnant, it happens that the eggs, and conception in the most, and most perfect creatures, is first begun long after coition. And that the Female also is *prolificall*, before any thing of the conception be at all contained in the Womb, many indications do conspire to ascertain, as shall be afterwards discovered in the *History of Viviparous Animals*: as the enlargement of the Breasts, and the turgid swelling of the Womb, by which and other Symptomes we may perceive an *Alteration* in the whole Body.

But as for the *Hen*, though she have for the most part the Rudiments of eggs in her before coition, which are afterwards by the Tread made *prolificall*, and therefore she then hath something in her presently upon coition, or treading; yet when it falls out

out to with her, that like other creatures, she hath nothing at hand ready in her *Ovary*, or hath already layd all the *egges* she formerly had there; she being afterwards trod (though some time pass between and intervene) as if she were then both *Principles* her self alone, or did possess the power of both *Sexes*, doth after the manner of *Plants* generate *egges* by her self, and those too (I speak it knowingly) not *subventaneous*, but *prolific*.

For if you take all the *eggs* from under a *Hen* that is now sitting, in case that very *Hen* was a fruitful *Hen* in former time (though she have now already layd all the *eggs* she hath, and have not so much as one remaining in her *Ovary*) she will lay again, and those *eggs* shall be *fructifying*, *prolific* *eggs*, having the principles of both *Sexes* in them.

In what respect the Henne may be called the Primum Efficiens, the first or Chiefe Efficient. And also of her issue.

EXERCIT. XLI.

WE have already pronounced the *Hen*, to be an *Efficient Cause* of *Generation*, or *natures Instrument* in that employment; (but she is not absolutely, and *per se*; but by commission, and by vertue of the *Male* rendered *prolific*.) But as the *Male* is by *Aristotle* counted the first principle of *Generation*,

Lib. 9. c.
50.

Generation, suo merito, upon his own score, because the first *Motus* or progress towards *Generation* proceeds from him ; so the *Hen* also may in some respect be esteemed the first cause of *Generation* ; inasmuch as the *male* by the approach and presence of the *female*, like one possessed, is inflamed to *Venerary*. The *female-Fish* (saith *Pliny*) at the time of coition will pursue and follow the *Male*, punching his belly with her head : And again, about the time of bringing forth, the *Male* will do the like to the *Female*. I my self have sometimes seen the *male* *Fishes* follow the *female* that was ready to spawn, (just as *Doggs* doe a *salt-Bitch*) all in troops, that they might sprinkle her eggs so soon as she had laid them, *lacte suo*, with their milkey substance, or seed. But that is most sensible in wanton and lascivious *females*, which will stirre up *Cupids* slow and drowfie fires in their tame *males*, and instill a silent love into them.

And hence it is, that the *Dunghill-cock*, so soon as ever he sees his own spouse whom he hath missed never so little a while, or any other *stranger-Henn*, being presently arrested at *Cupids* suite, he mounts her. And likewise when he is *Victor* in fight, though he return wounded and wearied from the battel, yet he still delights to ravish his captives wives. And that he may kindle this declining spark of lust, which now lyes expiring in his breast, into a vigorous flame, with several *gesticulations*, incitements, and *Love-scenes* (while he often crows, assembles his *Henns*, and now approaching circuits about them, and trailes his stiffe wings at their feet) he enticeth his *Females*, as by a spell or enchantment, to sport with him. Now these are the *Cocks* projects and arts : but sometimes the coyness and morosity of the *Hen*
doth

doth not a little conduce to rouse and heighten the males sleepy heat, and languishing appetite, to quicken and encourage his performance. But of these provocations and allurements, so farre as they serve to promote conception, we shall speak more anon. For if you carefully ponder Natures works, you shall finde none of them made in vain, but all directed to some end, and for some good.

Almost all females are pleased & delighted with the act of *coition*, and rejoyce at their great bellies, but many groan at their delivery. But the thing is quite contrary in *Hens*, which in *coition* complain, and hang back; but in *laying*, though the Egge be very great in comparison of their own bulk, and the streights of the *Uterine Orifice*, and the Egge brings no furtherance at all to his own release, (as the Issues of *Viviparous animals* do) yet she brings forth without any pain, and still rejoices as soon as she hath *layd*, and raising a loud laughter, invites in the Cock to share in her triumphs.

But though there are many rudiments of eggs, of different magnitude, and degree, in the *Hens Ovary*, insomuch that some are augmented and come to maturity before others, yet they all seem to be fructified alike, and receive the prolificall stamp together, by the Cocks *coition*.

And though a good space of time pass away (namely, thirty dayes or more) before the *Common-ben* or *Partridge-ben* disburden all the Egges in their *Ovary*, yet when ever the *Hen* sits upon them, they bring forth all their *chickens* almost together, at the set time (namely, in the compass of twenty, or two and twenty daies) and they are all likewise no less complete, then if they had all taken

ken the same rise and original at the same instant of coition (as the Bitches *whelps* do.)

And being upon this contemplation, while I consider how small the *prolific* ground-works of Eggs are, namely little *whelks*, and exudations, less than the seeds of *Millet*; and meditating the stature, magnanimity, and furniture of the *Cock* who is born from thence; I cannot but admire, that Nature should intrust such great abilities to so slender beginnings: and observe, how the *Omni-potent Creator* is pleased to manifest his greatness most, in the smallest originals.

Lib. 17. c.
10.

For the *Hen*, and the *Cock*, that haughty and magnificent Animal, springs from a small and almost invisible *whelk*. A vast Tree rises from a little *Acorn*. Nay, from the smallest bud and point of an *Acorn*, how doth the Aged *Oak* display her spreading armes? how lofty a crest doth she exalt to heaven? and how deep a root doth she send down 40 fathom the earth? It is indeed (saith Pliny) an incomprehensible miracle, that a substance which defies the axe, that presses, undaunted at the hugest weights, that masts patient of the largest sails, and ramms unbattered by the shock of Towers, and Bullwarks, should proceed from so mean principles. But this is Nature's power, this her ability. Now there is such a little sprout in the seeds of all Plants, whose bare top of all no bigger than a point, if it be once pared away, all hope of generation presently dies, as if the entire *plastical* virtue that is to fashion and compose the whole Tree, did take up its abode in so small a point. And therefore the provident *Ant*, eating of this small particle before hand, doth safely treasure up the grains and seeds of corn in her barns that lye under ground, cunningly

ningly providing by this meanes against the inconvenience which the might suffer in their growing atresh. The Cypress-Tree (saith the same Pliny) beareth a seed exceedingly affected by the Ant; and this enlarges the miracle, that so inconsiderable an Animal should devour and destroy so vast a Tree in its cradle. But of these also in general we shall speak more, when we shall shew that many Animals themselves, especially *Insects*, do germinate and spring from seeds and principles not to be discerned even by the eye, by reason of their contract invisible dimensions, (like those *atomes*, that fly in the aire) which are scattered and dispersed up and down by the winds: all which are esteemed to be *Spontaneous* issues, or born of *Putrefaction*, because their seed is not any where seen. And this speculation is useful to that *Philosophy*, which teacheth, that all things are made out of nothing; for between the *Original*, and the *Complement* of any Living creature, there is almost no commensurable proportion.

Nor are we so much to admire, what it is in a Cock, that doth conserve and govern so perfect and noble a creature, and is the first cause of his existence, which we say is his *soul*: but farre more what it is in the *egge*, nay in the very *whelk*, which hath so grand an authority to produce so gallant an *animal*, and advance its own renown to so high a stretch of glory. Nor are we only to admire, how great the *Artist* is that doth assist and cooperate in so great a work; but rather the manner of conveyance, it being by the *contagion* of onely a momentary *cotion*: namely, what the thing is that passeth from the *Male* to the *Female*, from the *Female* to the *Egge*, and from the *Egge* to the *Fetus*? What it is, that is *hoc Traducis*, this Derived essence,

essence, which cannot be perceived to be either remaining, or touching, nor any sensible contained thing ; and yet doth operate with a vast discretion and providence, beyond all the bounds of Art : & which doth render the Egg *prolific*, even when it selfe is fled and vanished, not because it now doth, or hath touched before ; not fructifying only the perfect, and abolved eggs, but even the imperfect and intended only, when they are yet but *whelks* and *pushes* : nay the *Henne* her self. before she have yet produced any *whelks* at all, and that so nimbly, as if the *Almighty* himself should say, Let there be a production, and strait there is one.

Let *Physitians* therefore cease to wonder at what they do not finde, but with astonishment ; namely, at Contagious, Epidemical, and Pestilential Diseases, how they do foment and disperse their infection through the air, and propagate distempers like to themselves in other bodies, and by a secret course, as it were, by a solemn generation tacitly multiply, and grow sometimes so destructive, that (if God would leave the reins in their own hands) they would spread a sweeping desolation over *Men*, and *Beasts* : for greater things then these are the dayly results of the generation of *Animals*. For more, and abler operations are required to the Fabrick and erection of *Living creatures*, then to their dissolution, and plucking of them down : For those things that easily and nimbly perish, are slow and difficult in their rise and complement. *Seneca* (as he is wont) elegantly saith : *How long a time is required to ripen the conception for the Birth ! With how great care and tenderness is it trained when now it is an Infant ! With what choice of aliment is it cherished to a Youth ! and yet how obnoxious is this carcass at last ! how lost without*

Nat. quest.
l. 3. c. 27.

without any paines ! An age builds Towers, which one hour levels with the ground. With great caution things continue, but perish at an easie rate. The Forrest which is growing long, one active spark and moment turns to cinders. Nay, not so much as a spark ; for the conflagration of the vastest bodies, will put us onely to the expence of a *Burning-glass*, where the Sunne beames being assembled, and directed in a *Cone*, will raise a nimble flame to speed the mischief. So that nothing is difficult to *Natures* Royalty, which to the production of things is sparing of her power, and warily dispenseth it with a great deal of thrift, by insensible accessions ; but she is quick to destroy, running in full speed. In the generation of things, the best, eternal, and omnipotent God, or *Natures* deity, is evidently seen ; but all mortal things finde out a thousand wayes to ruine, of their own accord.

*How the generation of the Chicken
is procured out of the Egge.*

EXER. XLII.

WE have thus farre considered the *Egge*, as the *Fruit*, and *End* : it remaines, that we now treat of it, as the *Seed*, and *Principle*. Now pag. 28. we must enquire (saith *Fabricius*) how the generation of the *Chicken* follows out of the *Egge* ; taking our rise from that *Principle* or *Position* of *Aristotle* and *Galen*, and approved by all : namely, That all things that are made in this world, are produced of these three ;
the

the Agents, the Instruments, and the Matter. But because in natural Productions, the Agent is not without, but either existent in the Matter, or Instruments, he concludes, *That we are to consider of the Agent, and Matter only.*

But because we are here to shew after what manner the *Chicken* is made out of the *Egge*, I conceive it not useles, to demonstrate, how many several wayes one thing may be said to be made out of another : for by that means it will more clearly and distinctly appear, how many several wayes generation doth proceed from an *Egge*, and what is to be resolved, concerning the *Matter, Instruments, and Efficient.*

De gen. an.
l. i. c. 18.

Aristotle bath taught, that one thing is made out of another four manner of wayes : First, when we say the *Night* is made out of the *Day*, and a *Man* of a *Boy*; because this is after that. The second, when a *Statue* is made out of *Brass*, or a *Bed-stead* out of *Wood*, or whatsoever we affirm to be made of matter, that so a whole may result, from something that is formed, and in it. Thirdly, when of a *Musical*, a man unskilled in *Musick*, or of a *Sound*, a *Sick man*, or one contrary of another. Fourthly, as *Epicharmus* makes his exaggeration : of *Calumnies*, *Cursings*; of *Cursings*, *Conflict*. All which are referred to the first beginning of the progress; for the *Calumnies* are a certain part of the whole *Broile*. Since therefore one thing may be made out of another so many wayes, it is apparent, that the *Seed* is in another, two of these wayes. For that which is begotten, is out of it, either as out of its matter, or as its first mover. For it is not barely, as this thing is after that, as *Navigation* after the *Panathenea*, nor as one contrary out of another; for a contrary is begotten out of the corruption of a contrary, and there must needs be some subject matter, out of which, as out of a first

immanent

immanent thing it should be made. By which words Aristotle truly inferres, that the Seed proceeding from the male, is the *efficient cause* of the *Fatus*, or else the *Instrumental*; because it is no part of the *Fatus*, neither according to the First, nor third acceptation (namely, as this thing out of that, or as out of its *contrary*) nor is it the *subject matter*.

But, as he saith in the same place, that which proceeds from the *Male* in coition, is not truly and properly called *Seed*, but *Geniture* rather, and doth differ from *Seed* properly so called. For that is called *Geniture*, which proceeding from the *Generant*, is that first cause which obtains the beginning of the generation; namely, in those creatures which Nature hath designed to generation: but the *Semen* is that thing which takes its original from the coition of those two (namely, the *Male* and *Female* :) and such is the seed of all *Plants*, and of some *Animals*, in whom there is no distinction of Sex: as being that which is first mixt by the *Male* and *Female*, as it were a promiscuous conception; and such as we have formerly in our History declared the *Egge* to be, which is called both a *Fruit* and a *Seed*. For the *Seed* and the *Fruit* are distinct things, and differ ratione prioris & posterioris, under the notion of that which is first, and that which is after; for the *Fruit* is that which proceeds from another, the *Seed* is that out of which another doth proceed; otherwise they were both the same. It remaines therefore that we enquire, how many of the foresaid wayes the *Fatus* doth proceed, not from the *Geniture* of the *Male*, but from the true *Seed*, or *Egg*, or *Conception* (which are truly the seeds of *Animals*.)

*How many waies the Chicken
may be said to be made out
of the Egge.*

EXERCIT. XLIII.

IT is therefore granted, that the *Chicken* is made out of a *prolificall Egge*, as out of its *Matter*, and as by its *Efficient*; and that the same *Egge* is both the *Causes* of the *Chicken*. For as it deduceth its original from the *Hen*, and is esteemed the *fruit*, it is the *Matter*: but in as much as it containeth in it, throughout all its substance, a *plastical*, and *prolificall* virtue infused by the *Male*, it is called the *Efficient* of the *Chicken*. So that not onely (as *Fabricius* would have it) these things are inseparably joyned together in one and the same *Egge*; namely, the *Agent*, and the *Instrument*, but it is also necessary, that the same place should also containe *Aliment*, by which it should be nourished. So that in a *prolificall Egge* these four things are to be found together; namely, the *Efficient*, the *Instrument*, the *Matter*, and the *Aliment*, as appears plainly in our History.

Wherefore we affirme, that the *Chicken* is made out of the *prolificall Egge* all the fore-said waies; namely, as out of its *Matter*, *Efficient*, and *Instrument*: and also as a *Man* is made out of a *Body*, and the *Whole* out of a *Part*: and also *tanquam ex Alimento*, as a thing may be said to be made of its nutriment; and likewise as a *contrary* is made out of a *contrary*.

For when by *Incubation* (by the *Internal motive principle*) some clear part is liquefied (which we call *Ovi Oculum* the *Eggs-Eye*) we say that very thing

thing is made *tanquam ex contrario*, as a contrary out of a contrary : as we suppose the *Chyle* to be made out of *contraries* by *concoction* ; (namely, out of crude, unconnected meats) and in the same sense, as we our selves are said to be nourished by contraries. Just in that manner is the *Colliquamentum* and the *Oculus Ovi* made of the *White*, and augmented : and in that manner likewise is the *Blood* and the *Vesicula pulsans* (which are the first particles of the *Chicken*) made, nourished and augmented, out of that white liquor, or *Colliquamentum* : nourished I say, the Nutriment being *assimilated* by *concoction* (as out of its *contrary*) by the power of the *innate heat* ; for that which is *crude* and *unconcocted*, is *contrary* to that which is *concocted* and *assimilated* : as a *Man unskilled* in *Musick* is *contrary* to a *Musitian* ; and a *Sick man*, to a *Sound*.

And when *Blood* is made out of the white *Colliquamentum*, or the *Colliquamentum* out of the *Yolk* or *White*, it is called the *generation* of the one, and the *corruption* of the other : there being an *alteration* made from the *contrary* to the *contrary*, the same *subject matter* remaining still. For the proceeding form of the *White* being corrupted, the *Colliquamentum* ariseth : and from the *privation* of the *form* of the *Colliquamentum*, resulteth the *form* of *Blood* : in the same manner as *nourishment* is turned into the *substance* of that which is nourished.

Therefore in this sort the *Chicken* is said to be made out of the *egge*, *tanquam ex Contrario*, as out of a *Contrary*. For the *Chicken* being nourished and increased in the *Egg*, both the *Yolk* and the *White* are corrupted and consumed, and afterwards all the *substance* of the *Egg*. It is therefore ma-

nifest that the *Chicken* is made out of the *Egg*, as out of a *contrary*, namely, as out of *Aliment* : and also, *tanquam ex privatione*, & *non ente*, as out of a *Privation* and *non Ens*. For the first particle of the *Chicken*, (namely the *Blood*, or *Punctum saliens*) is made *ex non sanguine*, of that which is not *blood*, and altogether its *contrary*, the same *subject Matter* still remaining.

The *Chicken* also is made out of the *Egg*, *sicut vir ex puero*, as a *Man* is made out of a *Boy*. For as out of *Plants Seeds* are made, out of *Seeds*, *Blossoms*, *Sprouts*, *Stems*, *Flowers*, and *Fruits* : so also out of an *Egge*, (which is the *Hens Seed*) is made the *dilatation* of the *Macula*, the *Colliquamentum*, the *Blood* and *Heart*, as the first particle of the *factus* (or *fruit*.) And that, *tanquam ex nocte dies*, as the *Night* is made out of the *Day* ; the *Sommer* out of the *Spring* ; and a *Man* out of a *Boy* : Where this thing, is after that. So that as the *Fruit* doth arise in the same *Stem* after the *Flowers* ; so likewise, after the *Egge* the *colliquamentum* ; and after that, as out of the *Humor Primigenius*, out of the radical first moisture, the *Blood*, after the *Blood*, and out of it, the *chicken* ; as the *Whole* out of a *Part*. And again, as by *Epicharmus* his *Exaggeration*, *ex calumniis fiunt maledicta*, & *ex maledictis pugna*, out of *slander* come *cursings*, and out of *cursings* *fighting*. For the *Blood* together with the *Punctum saliens* is first existent ; and doth likewise seem to be a part of the *chicken*, and a kind of *Efficient*, or *Instrument* of its *Generation*, inseparable from the *Agent* : (as *Fabricius* supposeth) Now, in what manner the *Egge* may be called the *Instrument* and *Efficient* of *Generation*, is in part shewed already ; and shall appear more at large hereafter.

It is evident out of our *History*, that the *Punctum saliens*

salient and the *Blood*, (while they increase) do assemble the rest of the *body* and all the other members of the *chicken* to themselves: as the *Yolk* in the *Womb*; descending from the *Ovary*, encompasseth it self with the *White*, and that by way of *concoction*, and *Nutrition*. Now all men conceive *calor innatus*, aut *calidum innatum*, the innate or primigenial *Heat*, or *Spirit* diffused through the whole, and the *Soul* in that *Spirit*, or the *faculty* of that *Soul*, to be the *common Instrument* of the *Vegetable Operations*. The egg therefore without all question hath its *Operative soul*, which is all in the whole, and all in every part; and contains a *spirit*, or *Animal heat* in it, which is the *immediate instrument* of that soul.

If any man therefore ask, how a *chicken* is made out at the *egge*? We reply, after all those ways recited by *Aristotle*, or invented by any else. after the which, one thing may be made out of another.

*Fabricius is mistaken concerning the
Matter of the Generation of the
Chicken out of the Egge.*

EXER. XLIV.

AS I decreed with my self from the beginning, pag. 28.
so I shal continue to take *Fabricius* along with
me in my progress: and therefore we shall consider
with him of those three things, which he saith
are to be inquired after in the *Generation* of the
P 3 *chicken*

chicken, namely, the *Agent*, the *Matter*, and the *Aliment* of the *chicken*. All which ought to be in an *egge*, concerning which he proposeth some doubts, together with the opinions of Authors, who are of another mind. The first doubt relates to the *Matter* and *Aliment* of the *chicken*. Indeed

De Nat.
pueri.

Hist. an. l. 6
c. 3. and
De gen. an.
l. 3. c. 1.
& 3.
l. 10. c. 53.

Hippocrates, *Anaxagoras*, *Alcmaen*, *Menander*, and all the ancient Philosophers, did conceive the *Chicken* to be born out of the *Yolk*, and nourished by the *White*. And *Aristotle* and *Pliny*, contrary to that opinion, did believe, that the *chicken* did assume its body from the *White*, and its *Aliment* from the *Yolk*. But *Fabricius* for his own part, conceived neither *Yolk* nor *White* to be the *Matter* of the *chicken*: endeavouring to confute the former opinions, and to shew, that both *Yolk* and *White* did serve to nourish the *Chicken*. And this, besides other Arguments (which I conceive to be of less force) with this which is evincing enough, namely that the propagations of the *Umbilical Vessels* (by which without doubt the *chicken* doth attract his *Aliment*) are disseminated both into the *Yolk* and *white*, and that both those liquors (accordingly as the *chicken* encreases, and doth expend a greater stock of nourishment) are quite exhausted. And hereupon *Fabricius* for confirmation of his opinion, saith: *There are three onely substances which do conduce to the fabrick of the egg, and the generation of the chicken, the White, the Yolk, and the Chalazæ: the White and Yolk are the Chickens substance; therefore the Chalazæ onely are the subject matter of the chicken.* But that the most excellent *Fabricius* is in an error, we have demonstrated before in our *History*. For after the *chicken* is well nigh compleated, when his *Head* and *Eyes* are distinctly to be seen, the *Chalazæ* are still

pag 34.

found

found in the *Egg* far remote from the *Chicken*, and still entire, being then depressed from the two ends of the *egg* to the sides, and do execute (as he also confesses) the office of *Ligaments*, to keep the *Yolk* in its true position within the *White*. Nor is that true neither, which *Fabricius* addes to justify his perswasion; namely, that the *Chalazæ* are seated directly under the *Obtuse Angle* of the *Egg*. For after the first days *Incubation* the *Liquors* shift their stations; the *Yolk* is exalted, and the *chalazæ* are depressed from both ends, as hath been said.

He is also deceived, when he saith that the *chalazæ* are parts of the *Egg*: for in truth, the *egge* is constituted onely by the *Yolk*, and the *White*; but the *chalazæ*, as also the *membranes*, are onely certain litle *Appendixes* of the *White*, and nothing else but meerly the *extremities* of the *membranes* contorted and twisted, (as filaments or strings are twisted into a *Rope*) that so they may the better preserve the *Liquors* in their proper places, by a firmer tye.

And therefore his Inference is infirme, when he saith: *The chalazæ are found to be in that part of the egg where the chicken is made, and therefore the chicken is made out of them.* For even according to *Fabricius* himself, that can no wayes be: who confesses, that the *chalazæ* are to be found in the two *extremities* of the *egg*, and yet denies, that the *chicken* is any where made, but onely in the *Obtuse end* of it: in which end truly, from the very first setting out towards the *Generation* of the *Chicken*, there is no *chalazæ* to be found at all. Nay, if you make tryal in a *New-layd Egg*, you shall find that the superiour *chalazæ* is not directly seated under the *Obtuse end*, or the *cavity* thereof,

but inclining something to the side; nor on that side neither, where the cavity doth tend, but rather on the contrary side. Moreover, it hath been shewed before, that the scituation of the *Liquors* immediately upon *Incubation* is shifted, because the *Oculus*, or Eye of the egge being enlarged by the *colliquamentum*, is exalted to the cavity in the *Obtuse Angle*, upon which the *liquors* and *chalazæ* at each end do remove to the *sides*. For the *Macula* or *Speck*, which before *Incubation*, was seated in the midst between both the extremities of the egge, now being enlarged into an *Oculus*, or Eye, is adjoynd to the cavity in the *Obtuse end*; and one of the *chalazæ* is deposed from the *Obtuse Angle*, and the other is exalted (so much as the other is deposed) from the *Acute Angle*; (just as the *Poles* of the *World* are seated in an *Oblique Hemisphere*) and at the same time, the greatest part of the *White*, especially of the grosser part of it, doth sinck down to the *Acute Angle*.

pag. 35.

Nor is that true neither where he endeavors to infer a probable argument to prove the *chalazæ* to be the *Matter* of the *Pullus*, from the likeness & similitude of their consistence, alleadging, that the *chalazæ* do represent the first formation of the *Chicken*, by their figure and longitude, and have also as many twists or knots, as there are principle parts in the *Chicken*.

Nor is that *corpus Rubrum* (which he also took for the *Liver*) or red substance in the *chalazæ*, or any thing neer them, but in the middle of the *colliquamentum candidum*; and it is the rudiment of the *Heart* onely. Nor doth the example of the *Tadpoles* alleadged by him, square to his purpose, of which, saith he, you can onely discern their *Head* and *Taile*, that is, their *Head* and *spine of the Back*,
having

Ex.XLIV.*generation of the Chic.out of the Eg.* 217

having neither fore-legs nor hinder-legs. And he proceeds, that whosoever seeth a Chalaza, and one of these conceptions, will think he sees one and the same body.

Now I have made many dissections of these Tadpoles, and have seen a pretty large Belly in them, and in that Belly Guts, and a Liver, and a Heart panting; and also I have discovered their Head and Eyes too. But that which Fabricius takes for their Head, is their round figure, from which they are called *Gyrini*; because their form or figure in *gyrum vertitur*, curls into a round. They have also a Taile by which they swim, but legs indeed they want. Yet about the Solstice, they lose or cast their Taile, having then hinder-legs, and fore-legs beginning to strut out. Now there is nothing in the first divison of a Chicken into his Head and Spine, that any way resembles this; which should any way induce us to believe that the Chicken is made out of the Chalazæ, in manner of a Tadpole.

To proceed farther in the confutation of this matter, the worth of Fabricius (a man so exceedingly well skilled in Anatomy) forbids: nor indeed is there any great need, since the thing is so evident in our History. He at last concludes, that this his opinion is wondrous old, and was on foot in Aristotles dayes. But I rather think the opinion of Ulysses Aldrovandus to be old, by which it is thought, that the Chalazæ are the Cocks Tredde, out of which, and by which the chicken is procreated.

But neither of these opinions is true: for that the Grandines, or Chalazæ (the Italians call them *Galladura*, and our Country-men the Tredde) do either proceed from the Cock, or are his seed, is a vulgar

vulgar error, and an old Wifes tale, both heretofore, and in our times.

The Grandines (saith *Aldrovandus*) are the Cocks sperme, because no fertile Egge is without them. No nor infertile Egge neither; which he or knew not, or did not declare. And this *Fabricius* indeed acknowledgeth; but while he denyeth the Cocks seed to enter into the womb, or to be any where found in the Egge; yet he still contends, that the *Chalazæ*, before any other parts of the Egg, are chiefly stocked with fecundity from the power of the Males seed, and do contain a prolificall virtue; though he could not observe that there is no difference or distinction at all between the *Chalazæ* of the barren & the fruitful egge. But seeing he hath granted, that the very rudiments of Egges in the *Vitellary* are as well fructified by the Cocks treading, as those Eggs which are encompassed with the white. I suppose the occasion of his so able a mans error was this: It was hitherto (as we have often said) the received opinion of all *Philosophers* and *Physitians*, that the *Geniture* of the Male, or Female, or of both together, was the *subject matter* in the generation of *Animals*: out of which residing in the *Uterus* (after coition) the *Animals* are generated (in like manner as *Plants* are made, and spring out of the seeds sown in the ground:) nor was *Aristotle* much distant from this opinion, who would needs have the *menstruous blood* to be the *womans*, which the Males geniture doth coagulate, and so constitute the conception.

Now the fore-said Error being granted by all, (for an infallible principle) it is no great wonder, if afterwards (according to every mans particular conjecture) many false opinions do creep in. For they

they are quite beside their mark, who conceive that after coition some kinde of substance or matter doth remain, fit and convenient for the production of the *fetus*, or first conception; or that any thing else is formed in the cavity of the womb, which may be of like use with the seed which is sown in the bowels of the earth. For it is most certain, that in the *Uterus* of a Hen (and the same thing shall be afterwards evidenced of all females whatsoever) upon coition, nothing is to be discovered, more then was there before.

And therefore it is clear that *Fabricius* is out, when he saith, *As a Viviparous animal is incorporated of a little quantity of seminal matter, but that which sustaineth him afterward is in a great abundance: so also the little Chalazæ are sufficient for the generation of the Chicken; but all the other parts contained in the Egge, serve onely for his nourishment.* pag. 35.

By which words he declares, that he conceived such a kinde of substance was at hand in the Egge, for constituting the model of the *fetus*: lest hee should seem to recede any thing from the definition of an Egge, delivered by *Aristotle*; namely, *An Egge is that thing, out of part of which an Animal is produced, and the remainder of which becomes the nourishment for it when it is produced.* Hist. an. l. 3. c. 8. de gen. an. l. 2. c. 1.

And this therefore seemed an invincible Argument to *Fabricius*; Since there are three onely parts in the Egge; namely, the White, the Yolk, and the Chalazæ: and the two first do only administer nutriment to the Chicken; it must needs be that the Chalazæ only are the matter, out of which the Chicken is constituted.

Thus then it fell out, that this able Anatomist (while he sought in the Egge some convenient matter, out of which to constitute the Chicken) being

ing benighted by a vulgar Heresie, lost his way. And this inconvenience doth likewise befall many men more, who forsaking that light, which the frequent *dissection* of bodies, and the familiar converse with *Natures* selfe would help them to, doe yet persist to make discoveries out of their owne conjectures, or some conceived probable arguments, or the Authority of former Writers; when they themselves ought to look into the matter, and assent to it by their own sense. No wonder therefore that infinite errors, which were delivered over by common consent from the first dawning of Antiquity, are handed down even to our times: and that so by that means, men otherwise very ingenious, are egregiously deluded; because they conceive it plentiful satisfaction of minde to them, that they finde it in Books, and have their memories well loaded with sage sentences. For they that are thus Philosophers *ex traduce*, by descent and derivation, are just as wise as their owne Libraries.

To conclude therefore, there is in an *Egge* (as we have often said) no distinct part, or disposed matter, out of which the *fetus* may be formed and fashioned: but as in the *seeds* of *Plants*, there is a little point or budding shot out; so is there in an *Egge*, a small *Cicatrice*, or *Macula*, which being inspired with *plastical* endowments, enlarges it self into the *Oculus* or *Colliquamentum*, out of which, and in which, the *primordia* of the *Chicken* (namely the *Blood* and *Punctum saliens*) are ingendered, nourished, and augmented, till they become a complete *Chicken*. Nor is *Aristotles* definition of an *Egge* true, where he will have it to be that, out of part of which the *Chicken* is made, and nourished by the rest; unless you understand it thus: An *Egg*

is that, out of part of which a Chicken is framed, not as out of its Matter, but as *Vir ex Puero*, a Man is made out of a Boy: or thus; An Egge is a perfect conception, out of which the Chicken is said partly to be made, and partly to be nourished: or lastly thus; An Egge is that thing, whose liquors do serve both for the Matter, and Nourishment of the parts. And in this sense Aristotle teacheth, That the matter of the foetus in women is menstruous Blood, which (while it is poured into the womb by the veines) Nature employs it to another use; namely, to the use of Generation, that such another creature may be made, as it would have been; for it is already such in potentiâ, in possibility, as the bodies from whence it was separated; that is, the Mothers.

de gen. an.
l. 2. c. 4.

*What the Matter of the Chicken is,
and how the Chicken is formed
in the Egge.*

EXERCIT. XLV.

Since therefore the truth cannot, as I suppose, be obtained out of the opinions of other men, (whether they be confirmed by either their naked authority, or probable argumentations) unless wary experience be employed in the discovery: we shall declare to you out of Nature's own Volume, and clear Observations, what the Matter of the Fetus is, and how it is formed thence.

I have declared that one thing is made out of another (as out of its Matter) two several wayes, and that as well in artificial, as natural Productions, but especially in the Generation of Animals.

The

The First is, when one thing is made of another thing that is pre-existent; and thus a *Bedstead* is made out of *Timber*, and a *Statue* out of a *Rock*, where the whole *Matter* of the future fabrick was existent and in being, before it was reduced into the subsequent shape, or any tittle of the design begun. But the other way is, when the *matter* is both made, and receiveth its form at the same time. As therefore *Artificial productions* are perfected two several waies; one, when the *Artificer* cuts and divides the *matter* which is provided to his hands, and so by paring away the superfluous parts, doth leave an *Image* remaining behinde, as the *Statuary* doth: the other, when the *Potter* formes the like *Image* of *Clay*, by adding more stuff, or augmenting, and so fashioning it, so that at one and the same time, he provides, prepares, fits, and applies his *materials*: (and in this way an *Image* or *Figure* may be rather said to be made, then fashioned) so likewise in the *Generation* of *Animals*; some are formed and transfigured, out of *matter* already concocted and grown; and all the parts are made and distinguished together *per metamorphosin*, by a *metamorphosis*, so that a complete *Animal* is the result of that *Generation*: but some again, having one part made before another, are *afterwards* nourished, augmented, and formed out of the same *matter*; that is, they have parts, whereof some are before, and some after other, and at the same time, are both formed, and grow. Now the *Fabrick* or constitution of these, proceeds from some one part, as from its original, and by the help of that, the other members are produced, and these we say are made *per Epigenesin*, by a post-generation, or after-production; that is to say, by degrees,

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grees, part after part; and this is more properly called a *Generation*, then the former.

After the former way doth the generation of *Insects* proceed, as when by a *Metamorphosis* a *Worm* is made of an *Egge*; or as when out of a putrifying matter (the moisture drying, or the dry part growing moist) the *primordia* or rudiments are generated, out of which (as out of a Canker-worm now grown to its just magnitude, or out of the worm called *Aurelia*) by a *Metamorphosis* ariseth a *Butter-flie*, or common *Flie* in its just magnitude or stature, being nothing augmented since its first birth. But the more perfect *Animals* which have blood, are made by an *Epigenesis*, or superaddition of parts, and do grow, and attain their just stature or $\alpha\kappa\mu\eta$, after they are born. In those other, *Casus seu Fortuna*, Chance or Fortune, seemeth chiefly to promote the generation; in which the form ariseth *ex potentiâ materiae prae-existentis*, out of the power or potentiality of the pre-existent matter; and the matter is rather the first cause of the *Generation*, then any external *Efficient*. And hence it is, that these kinde of *Animals* are more imperfect, and do less continue their kinde, or are less durable, then *Terrestrial* or *Aquatile* creatures that have *Blood*, which attain a *Perpetuity* from an *Univocal principle*: (that is, from the same *Species*) the chief cause whereof we ascribe to Nature, and the *Vegetative Virtue*.

Some *Animals* therefore *suâ sponte nascuntur*, are born of their own accord, out of a *Matter* digested of it self, or else casually, as *Aristotle* seems to assert: *Whose Matter is capable of mutation of it self, undergoing that mutation by Chance, which seed* *Metaphys.*
l. 7. c. 9. *doth, in the generation of other Animals.* And the same thing falls out in the generation of *Animals*,

as

as in Art: for some things are accomplished by Art, and those very things, by chance too; as *Health*: and other things againe are never produced without Art, as a *House*.

Bees, Waspes, Butterflies, and all those creatures, that are generated out of a Worm by a *Metamorphosis*, are said to be *Casu orta*, creatures bred by chance, and therefore things not preserving their kind: but a Lyon, or a Cock, are never made by chance, or of their own accord, but have their existence from *Nature*, or a more divine operative faculty; at whose hands they rather require, that it produce a *Species* like to themselves, then supply a fit *Matter*.

In *Generation* by *Metamorphosis*, creatures seem to be fashioned like things wrought off with a *Mould*, or the *Print* of a *Seale*; where the whole *Matter* is transformed. But an *Animal* produced by *Epigenesis*, attracts, prepares, concocts, and applies the *Matter* at the same time, and is at the same time formed, and Augmented. In those the *Plastical* vertue divides the same similar *Matter*, and being divided, disposes, and reduces it into members; out of a *similar Matter* making a *dissimilar*; or out of a *similar subject Matter*, *dissimilar Organs*. But in these, while it produces diverse parts, and those parts diversly disposed, one after another; it requires and makes a diverse *Matter*, and that *Matter* diversly disposed, or qualified, such as may be convenient to the production of different parts. For which cause we conceive, that the *Perfect Egge* is constituted and made up of several parts.

It therefore is clear by our *History*, that the generation of the *Chicken* out of the *Egge*, proceeds rather *per Epigenesin*, quam *per Metamorphosin*, by
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an *Epigenesis*, then by a *Metamorphosis*; and that all its parts are not constituted at once, but successively, & in *Order*; and that while it is augmented it is also formed, & while it is formed, it is also augmented; as likewise that some parts are superadded to others, and distinguished from others; and that the beginning, increase, and perfection of it do proceed by way of growth, till at the last the *Fetus* doth result. For the forming *Faculty* of the *Chicken*, doth rather acquire, and temper its own *Matter*, then find its *Matter* ready tempered, and fitted to its hand; and the *Chicken* seems more to be framed, and increased by his own self, then by any other. And as all things are increased or nourished by the same things, out of which they are made; so likewise the *Chicken* is in all likelihood made by the same thing; (be it the *Soule*, or some *faculty* of the *Soul*) by which he is preserved, and sustained. For the same *Efficient* and *Preserver*, is found both in the *egg* & in the *Chicken*; and out of the same *Matter* of which it doth constitute the first particle or rudiments of the *Chicken*, it nourisheth, augmenteth, and superaddeth all the other parts. Lastly, in *Generation* by *Metamorphosis*, the whole is distributed and distinguished into parts; but by *Epigenesis* the whole is constituted, and made of parts, by a certain order and succession.

Wherefore *Fabricius* did erroneously seek after the *Matter* of the *Chicken*, (as if it were some distinct part of the *egge*,) which went to the embodying of the *Chicken*) as though the *Generation* of the *Chicken* were effected by a *Metamorphosis*, or transfiguration of some collected lump or mass, and that all parts of the body, at least the *Principal* parts were wrought off at a heat, or (as

Q him-

himself speaks) did arise and were corporated out of the same *Matter* : and not by *Epigenesis*, in which an order is observed according to the dignity, and worth, and use of the *Parts* ; where first a small foundation is laid, which at the same time while it doth increase, grows distinct, and formed, and so attains all its parts by degrees, according to their proper order, which are supergenerated, and born to it.

For as the little *top* or *point* which jets forth or protuberateth from the *Acorne*, taking heat and encreasing, multiplies into a *Root, Wood, Sap, Bark, Shoots, Tendrels, Boughs, Blossoms, and Fruits*, and at last ariseth into a compleat *Tree* : such is the progress of the *Chicken* in the *Egge* ; the *Cicatrice* or small speck, which is in the foundation of the future *Pile*, increases in *Oculum*, into an *Eye*, and at the same instant is distinguished into a *Colliquamentum*, or dissolved substance, in whose *Center* is born the *Punctum sanguineum pulsans*, the *Bloody panting point*, together with the *Ramifications* of the *Veins* : from these doth by and by result the *Nebula*, or little cloudy *Substance*, and first concrete *Matter* of the future *Body*, which also as it grows, is divided, and distinguished into parts, but not all at once, but such as give place and eldership to one another.

To conclude therefore, in the *Generation* of those *Animals*, which are produced by *Epigenesis*, (as the *Chicken* in the *Egge* is) we are not to enquire a particular or distinct *matter*, out of which the productions should be imbodyed, different from that out of which they are nourished and increased : for it is nourished and encreased by the same *matter*, whereof it is made, and so on the other hand, the *Pullus* in the *Egge* is constituted out of the

the same *matter*, by which it is sustained and augmented. And *potentiâ animal*, an *Animal in potentiâ*, is one and the same thing, with *Alibile* and *Augmentativum*, a creature fedde, and augmented in *potentiâ*, (as we shall shew hereafter) and do differ onely *ipso esse* formally, (as *Aristotle* saith) but otherwise are the very same. For, for as much as this particular thing is, and is convertible into substance, *Nutritivum est*, it is *Nutritive*: and for as much as it is *quantam*, indued with quantity, it is *Augmentativum*, *Augmentative*: for as much as it is substituted in the room of a substance that is lost, *Nutrimendum appellatur*, it is called *Nutrimment*: for as much as it is added to a substance already in being, *Incrementum dicitur*, it is called *Growth*. And the same thing is *Materia*, the *Matter* in the *Generation*; *Alimentum*, the *Sustenance* in the *Nutrition*, and *Incrementum*, the *Increase* in the *Augmentation* of the *Chicken*. But that is formally and simply said to be generated, whereof no part was existent before, but that to be nourished and grow which was, and had an existence or being before. That part of the *Fetus* which is first made, is said to be begotten or born: that which is substituted or superadded to it, is said to be *annate*, *aggenerate*, or born to it. There is in all things the same generation, and transmutation from the same into the same: which is performed in respect of a part, by *Nutrition* and *Augmentation*, but in respect of the *Whole* by *Generation*: else it is the very same in both. For from whence the first existent *matter* proceeds, from thence also doth *Nutrimment* and *Growth* accrew unto it.

And it shall also appear by that which shall be delivered hereafter, that all *Parts of Bodies* are nourished

rished by the same *Nutritive* substance diversly transformed or altered. For as all *Plants* do indifferently spring, grow, and are sustained from the same *Common Nutriment*, diversly varied and digested (whether it be Dew, or the juice and moisture of the ground) so likewise out of the same *Liquors* of the *Egge* (namely, the White and Yolk) the whole *Chicken*, and all its parts are procreated and encreased.

We will then also explaine, what *Animals* are begotten by a *Metamorphosis*: and what kind of pre-existent matter that of the *Insects* is, which spring from a Worme, out of which, all the parts are together constituted and concorporated, and at last a perfect *Animal* born, by Transmutation onely: as also what *Animals* have any order and degrees in their production, and have their *Parts* produced successively: and what kind of creatures they are which are first borne imperfect, but afterwards shoot up, and attain to perfection, as all those that are produced out of an *Egge*.

These, as they are together made, and augmented, growing, and transformed; and are by a proposed method and order distinguished into parts; so have they no immediate pre-existent Matter (such as is usually designed them; namely, the commixture of the feminine and masculine seed, or the *Menstruous Blood*, or some litle portion of the *egge*) out of which the *fetus* should assume his body; but so soon as ever the Matter is made and provided, it grows also, and takes some shape; so soon as there is a *Nutrient*, there is a creature to be nourished by it.

And this *Generation* is rather by *Epigenesis* (as a *Man* is out of a *Boy*) that is, the fabrick and structure of the body is out of the *Punctum saliens*, as
out

out of its foundation : as out of the Keel the Ship is built : and rather as the Potter forms an Image, without any *pre-existent Matter* ; then out of any *subject matter* : as the Carpenter forms a Bench out of Boards : and the Statuary a Statue of Marble. For out of the same *matter* whence the first particle of the Chicken , or its least *atome* arises , thence also doth the whole Chicken proceed : whence the first small drop of Blood, thence also is the whole stream or current of it generated in the egg: whatsoever gives a consistence or being to the members or *organical parts* of the body, doth also afford the same to all the *similar parts* likewise ; as, to the *Skin, the Flesh, Veins, Membranes, Nerves, Cartilages, and Bones*. For that very part which was soft and fleshy, at first, is afterward upon its increase, made a *Nerve, Ligament, Tendon*, by the same *Aliment* ; that which was onely a *Membrane* , becomes a *Coat* ; and that which was a *Gristle*, is afterwards advanced into a *Skin* or *Bone* ; and this by the same *similar matter* variously altered. For a *similar mixt body* (which is commonly conceived to be framed out of the *Elements*) is not made of the *Elements* first subsisting apart by themselves, and then afterwards compounded , united, and altered, but out of this particular mixt body being altered, another mixt body is born and produced, that is, Of the *Colliquamentum* is the *blood* made, of the *blood* the *bulk* of the *body*, which bulk at first doth appear *similar*, and like the *Spermatical Gluten*, or clammy substance ; but from it the parts are delineated by an obscure indiscernable division at first, but afterwards become *organical* and distinct.

Those similar parts, I say, do not arise from the dissimilar, and heterogeneous *Elements*, united to-

gether, but are framed and discriminated by Generations out of a *similar* substance, and so become *diffimilar*. As if by the Omnipotents command, or fiat, the whole Chicken were created.

As thus : let there be a *similar White* lump, and let that lump or mass be divided into parts, and increased ; and while it is increased, let there be a secretion and delineation of the parts ; and let this part be harder, thicker, and whiter ; and that softer, and well coloured ; And it was so. For thus doth the structure of the Chicken in the Egge proceed daily ; out of one and the same *matter* are all its *limbs* and *utenfils* made, nourished, and augmented. From the *Spine* first do the *Ribs* grow out, and the *Bones* are distinguished from the *Flesh*, by their most white slender *Lines* : three *Bulle* are discernable in the *Head*, which are all fraught with a *CrySTALLINE Water*, being the Rudiments of the *braine*, *After-braine*, and (as by a sprinckled black streak is implied) of one of the *Eyes* : The substance which at first resembleth *coagulated milk*, becomes at last *gristly*, *spinous*, and *bony* : and that which at first was *white*, and *gelly-ish* : passeth at length into a *blushing flesh*, and *Parenchyma*. That which was formerly most transparent and pure *Water*, is transformed anon into the *braine*, *After-braine*, and *eyes*. For there is a far greater, and diviner mystery in Generation, then a bare assembling, altering, and compounding of *Parts* : for the *Whole* is made and discovered before its *parts* : the *Mixt body* before the *Elements*. But of this more hereafter ; when also its *Causes*, and *Principles* come to be assigned.

Of the Efficient Cause of the Generation of the Chicken, and Fœtus.

E X E R. XLVI.

THUS far of the *Matter*, out of which the *Chicken* springs in the *Egge*: it remains now that we enquire a little with *Fabricius*, concerning the *Efficient cause* of the *Chicken*. But because it is a perplext business, and *Authors* do no where more cavil and contend; and *Aristotle* himself is wonderful intricate in explaining it; and also many doubts, not to be despised, do interpose; I conceive it worth the while, (as we have done in making search after the *Matter*) in the first place to set down, how many ways a thing may be said to be *Efficient*, or *Effective*: that so it may more certainly and distinctly appear, what is to be enquired after under the name of *Efficient*; as also what is to be resolved concerning the opinion of *Authors* about this *matter*: and that it may likewise appear out of our own observations, what is to be truly and properly called an *Efficient*.

Aristotle defines an *Efficient cause*, to be that from whence the first beginning of *Mutation* or *Rest* proceeds; as an *Adviser*; a *Father*; and simply, he that doth a thing, of the thing that is done; that which is the transmutor, of that which is transmuted. Whereupon many and sundry kinds of causes, from whence a motion or mutation doth proceed, are brought and amassed in the *Generation* of *Animals*: sometimes an *accident*, or *quality* is assigned

Metaph. l. 3. c. 2. & Phyl. l. 2. c. 28.

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the *Efficient*, and so the *animal heat*, and *forming faculty* are alledged, as the *Efficient*. Sometimes an *external substance* before existent, in which the *plastical power*, and *forming faculty* resides; as the *father*, or the *seed* of that creature by whose efficacy the *Chicken* is procreated of the *egge*. Sometimes some *internal substance* existent by it self; as the *spirit*, or *Calidum innatum*. And sometimes some other substance; as the *Form*, or *Nature*, or *Soul*, or some *Vegetative part* of the *Soul*: which kinde of principle, we have said, is in the *Egge*.

Moreover, because some things from which *mutation* doth proceed, are *neerer causes* of it, and some more *remote*: thereupon sometimes *media*, the things between the first *efficient*, and the last *effect*, and also the *Instruments* are counted *Efficients*: as also *subordinate ends*, or the *principles* of subsequent things, are ranked amongst *efficient causes*; and hereupon is it, that some parts are called *Genital parts*; as the *Heart*, from which *Aristotle* affirms the other parts to proceed, as is clear also by our *History*. I say the *Heart*, or at least the rudiment of the *Heart*; namely, the *Vesicula*, and *Punctum saliens*, doth erect and set up the rest of the *Body*, as a future *habitation* for it self: and when it is built, takes possession, enlivens, and swaves it, and fortifies it with the superaddition of the *Ribs*, and *Breast-bone*, as with a *Bulwark*: and becomes, as it were, a *Tutelar God*, the first *chamber* that entertaines the *soule*, the first *receptacle* of the *primigenial heat*, and the *Vestal animal-fire*; the source and fountain of all the *Faculties*, and the only solace in *Afflictions*.

Again, since the *Efficient* is so called, in order to the *Effect*; seeing by *Epigenesis* some parts are after other in order, and divers also spring from those

those that are before them: it is therefore probable, that as the *Effects*, so the *Efficients* are also diverse; which produce diverse works, from which also diverse *mutations* do proceed. So *Physitians*, in the *Physiological* part of *Physick*, do constitute some *Instruments* of *Chylification*, some of *Sanguification*, and some of *Generation*: and some *Anatomists*, an *Offical*, *Carnifical*, and a *Nervifical* faculty; which they depute to make the *Bones*, the *Flesh*, and the *Nerves*.

But in the *Generation* of the *Chicken*, the *efficient causes* must needs differ, by reason of the several *actions* relating to it, which differ very much; which, though they may seem *Efficientes per accidens*, contingent *Efficients* of *Generation*, yet are they necessarily required, since nothing could be done without their associat ayd. For while they remove external *Impediments*, or do cherish, or awaken the *conception*, and *de potentiâ in actum deducunt*, raise it from *possibility* into *actual being*, they are justly stiled *efficients*. And in this *Rowle*, the *Incubation* of the *Hen*, the temper and warmth of the *Place*, and *Air*, the *Spring-time*, and the approach of the *Sun* by the *Zodiack*, may be well listed: as also the *preparing causes*, which cause the *Yolk* to ascend, the *Macula* to be dilated; and the *resolution*, or melting of the *humours* in the *Egge*, may be mustered amongst *efficients*.

And then the *Generative* and *Architectionical* faculties, which *Fabricius* calls *parts*, are to be numbred with the *efficient causes*; as, the *Immutatrix*, *Concoëtrix*, *Formatrix*, & *Auctrix*, the *Altering*, *Concocting*, *Forming*, and *Augmenting* faculty; as also those causes that are *efficients* in the *Accidents* relating to the *Chicken*, as that, by which the *Chicken* is either a *Cock*
or

or a *Henne*, resembling the *He* or *Shee-parent*; and that in relation to the form of the *Cock* which was concerned in the former, or latter coition; whence it comes to pass that the *Chicken* is an *animal*, and that an entire one, and not dismembered, sturdy, and sound, not diseased, and *craffie*, but a long liver; and retaining the *Species*, or degenerating from it; or proves a *Monster*, or of a mixed race.

Lastly, since in treating of the *efficient* cause of the *factus*, we discover the notable *structure* of it, and the *actions*, *functions*, *uses*, and *benefits* of all the *parts* and *members*, and with what *prudence*, *skill*, and *judgment*, by how *divine* an *inspiration* all things are managed, and *artificially* composed for the advantage of *Life*: we must not only amuse our selves in inquiring, which is the *Efficient*, *Architect*, and *Projector*, but also adore, and admire the *Omnipotent Author* and *Preserver* of so great a *Fabrick* (as justly merits the title of a *Microcosme*.) We also enquire, when, and whence it proceedeth; and where this *divine Vicar*, and *Vice-Roy* of the *deity*, which is analogous to the substance of *Stars*, and neer allied to *Art*, and *Intellect*, takes up its residence, and keeps its *Court*.

It is apparent therefore by what hath been said, that it is a difficult thing to enumerate all the *efficient causes* of the *Pallus*: and we must needs referre the fuller disquisition of the thing to a general consideration; nor is it possible to treat fully and profitably of those things which agree to all in general, out of the single *generation* of the *Chicken* (without a clearer light borrowed by experience from other *Animals*.) And that the rather, because *Aristotle* himself hath recounted so many various *efficient principles* of *Animals*: For some-
times

times he ordaines (a) the *Male* the chief efficient (a) *Meta-cause*, as in whom the *Ratio pulli*, the *Reason* or *phys. 1.2.*
ground of the *Made Chicken* consists: according *& 4.1.*
to that, (b) *all things are made by the same Univocal.* (b) *Meta.*
Sometimes, (c) the *Males seed*: or (d) the *Nature* *7.10.*
of the *Male ejecting seed*. Sometimes, (e) *that which* (c) *De*
is in the seed, causing seed to be fruitfull; namely, the *par. an. 1.1.*
Spirit, and the nature in that Spirit, answerable in (d) *De*
proportion to the substance of the Starres. *gen. an. 1.*
Else where, *20.*
(f) *heat, (g) moderate heat, (h) a certain proporti-* (e) *Ibid.*
onable degree of heat, (i) the heat in the Blood; and *l.2.c.3.*
in some places, *the heat of the Ambient Aire.* Like- (f) *l.5.c.3*
wise (k) the *Winds, the Sun, the Heavens, Jupi-* (g) *l.4.c.2*
ter, the Soul, and in general, Nature, which is the (h) *l.4.c.*
Principle of Motion and Rest. And so by the same *4.*
rule, Any of the *Stoicks*, who thought the *Soul* to (i) *De*
be fire, may decree fire the efficient cause of *Anim-* *par. an. 2.2.*
als; because fire doth nourish and augment it *gen. an. 4.*
self, and seems in some sort to live at its own dis- *2.*
pose and liberty: though not our destructive *De gen. &*
culinary fire, but the *Natural, Celestial, Vegetative,* *corrup. l.2.*
Generating, and Healthy fire, which the *Heathen* *c.30.*
worshipped by the name of *Jupiter*, whom they *De gen. an.*
called the *Father of Men and Things*; not his lame *l.2.c.c.*
Brother *Vulcan*, (whose ayd and benefit we not-
withstanding daily use in several employments to
our great advantage) but the divine, *Animal Spi-*
rit, the Author of Living creatures.

And therefore *Aristotle* saith, That this question concerning the Efficient is very dubious; namely, *Whether it be an extrinsecal thing, or something insert-*
ed in the Geniture or Seed: and Whether it be a part
of the soul, or the soul, or something which hath a soul.

Wherefore that we may deliver and rid our
selves of the maze and labyrinth of the manifold
Efficient causes, in this disquisition of the Efficient
of

236 *How the efficient cause of the Chick.* Ex. XLVII.

of the *Chicken*, we have need of *Ariadnes* Clew, woven and cunningly wrought of the Observations of almost all *Creatures* living. And therefore it is to be deferred to a more general Inquest. In the mean time, we shall recount those things, which relating to the particular generation of the *Chicken* out of the *egge*, do manifestly appear, or are strangers to the common perswasion, or else do require any further search.

How the Efficient cause of the Chicken doth operate, according to Aristotle.

EXERCIT. XLVII.

ALL men generally confess the *Male* to be the primary efficient cause in *Generation*; as in whom the *Species* or *Form* resides: And they farther affirm, that his *Geniture* being emitted in coition doth cause both the being, and fertility of the *Egge*. But how the *seed* of the *Cock* doth produce the *chicken* out of the *Egge*, neither the *Antient* nor *Modern Philosophers* and *Physitians* have sufficiently explained, nor yet solved the question proposed by *Aristotle*. Nay *Aristotle* himself hath not done it. He saith, *The Male doth not conduce to the Quantity, but the Quality; and is Principium Motûs, the Principle of Mutation; but the Female contributes the matter.* And a while after: *Every Male doth not emit seed, nor is it any part of the Fœtus, in those that do emit it: As nothing which passeth from the Carpenter*

De gen. an
l. i. c. 20.

carpenter contributes to the matter of the Wood; nor is there any part of the Carpenters art in that which is made, but the form and species doth exist in the matter per motum ab illo, by the motion or mutation which proceeds from him. Now the soule in which the form and knowledge is, moves the hands, or other members, by the motion of a certain quality; which motion is either diverse, in such as make a diverse thing, or the same in such as make the same. But the hands and instruments move the matter. So the Nature of the Male which emitteth seed, imployes that seed, as an Instrument, and having motion actually in it, as in the productions of Art the Instruments are moved; for in them, in some sort, the motion of Art is implanted.

By which words he seems to imply, that Generation is made by the motion of a certain Quality. As in Art, though the first cause (namely ratio operis, the reason or ground of the work) be in the soul of the Artist; yet afterward the work is effected by the motion of the hands, or other Instruments; and though the first cause be removed (as in automatis, things that seem to move of themselves) yet is it in some sort said to move that, which at present it doth not touch, but hath touched formerly, so long as the motion goes on in the Instrument.

And in the following Book he hath these words: *The seed of the Male when now it hath access into the womb of the Female, it doth coagulate, and cause a consistence in the purest part of the excrement (meaning the menstruous blood residing in the womb) and doth transmute the matter which lies ready in the womb by such a motion or mutation, that at last, though the seed vanish after the motion is performed, some part of the foetus is existent, and that an ani-*

mate

Lib. 2. c. 4.

mate part (as the heart) which now doth augment and dispose it self, as a Son who is free from his Father, and hath taken a house of his own. It is necessary therefore that there be some principle by which afterwards the order of the members may be delineated, and all things disposed, which pertain to the absolution and complement of the Animal; and from which growth and motion may arrive to the rest of the parts, and be the author of all the similar and dissimilar parts, and of their last aliment. For that which is now an Animal, doth increase; but the last aliment of the Animal is blood, or something proportionable to blood, whose vessels and receptacles are the Veines. Now the principle or original of the veines is the Heart. But the Veines like Roots extend even to the womb, by which the Fœtus draweth his aliment. The Heart also being the beginning of the whole nature, and also the containing End, ought to be made first, as being a genital part of its own nature; which must needs be the first, as the original of the rest, and of the whole Animal, and of Sense: in whose heat (because all the parts are in the matter potentially) (since the principle of motion did abide, that which follows afterwards, is stirred up by it, as in those self-moving miracles; and the parts are moved, not shifting their places, but altering in softness, hardness, heat, and other distinctions of similar parts, being now actually made, which were potentially before.

This is *Aristotles* opinion almost word for word, by which he conceives the *fœtus* to be made of seed by motion; though it do not at present continue touching it, but hath touched it formerly: a nice opinion, and of a fine thread; and according to those things which are discovered in the order of the generation of the parts, not improbable. For the heart, together with the ramifications
of

of the *Veins*, is discerned first ; as being an *animate principle*, in which both *sense* and *motion* reside; and being also like a *free Son*, and a *Genital part*, by which the order of the member is delineated, and all things conducing to the accomplishment of an *Animal*, are disposed, and having all those attributes which *Aristotle* bestowes upon it.

But it seems impossible that the *heart* should be made in the *egge* by the *males seed* ; since that *seed* is neither in the *egge*, nor doth touch, nor ever did touch it: because it neither enters the *womb* (where the *egge* is made) as *Fabricius* confesseth, nor is any way attracted by it ; and besides this, the *mothers blood* is not in the *egge* neither, nor any other *prepared matter*, out of which the *males seed* might form this first *genital part*, the author of all the rest. Nor yet presently upon *coition* (while the *seed* as yet remaines within, and is tangent) doth any particle of the *chicken* exist, but many dayes after, upon *Incubation*. And it is likewise improbable too, that in *fishes*, where the *males geniture* only toucheth the *egge* on the outside, but doth not enter into it, that the *geniture* should have any more operation and power upon it, (since it is meerly an *external Agent*) then the *Cocks seed* hath upon the *Hennes egges* which are now perfectly formed.

Again, since presently after *coition* there is no track of the *egge* extant, but that it is afterwards generated by the *Henne* by her self, and that *prolific* too, when now the *Cocks seed* is clean gone and vanished ; it is unlikely that the *fetus* should be made by that *seed* in that *egge*, by one single motion, or by successive motions.

Nor do *prolific* eggs differ from *improlific*, and *subventaneous* in this, that the former contain the
Cocks

De gen. an.
l. 1 c. 18.

Cocks seed (as *Aldrovandus* would have it ;) nor is there found any thing done or *coagulated* in the *egge* by the seed of the male, or any sensible alteration made, (for there is no sensible difference at all between a *prolific*, and an *addle egge*) and yet a *prolific*, which is conceived a long time after *coition*, contains in it the power of both *Sexes*, and the capacity of being made, and of making a *chicken*: as if it had deduced its original from the *coition* of both *Sexes*, and their consent and conspiring together in one, as *Aristotle* would have it; who being pressed by that argument, (as we have declared before concerning the generation of the *egge*) did constitute a soul in the *egge*; which if it be there, must without scruple be the *principle* and *efficient*, of all those things which are naturally met with in the *egge*. For it is most certaine, What thing soever at last it prove which doth procreate the *chicken* out of the *egge*, (in whose fabric so much skill, so divine contrivance and providence is required; fitting eyes for sight, the bill for reception of the meat, the feet for walking, the wings for flight, and all the other Utenfils for some employment or other) that it is either a soul, or else something more worthy and excellent than a soul, working by wisdom and providence.

And by the generation of the *chicken* it is also manifest, that whatsoever be the *principium vite*, the first cause of life, and vegetation, was first of all in the heart. Wherefore, if it be the soul of the *Chicken*, it is plain that it also was in the *Punctum saliens*, and in the *Blood*; because we discover motion & sense there: for it moves and dances like an *Animal*; so that if the soule do exist in the *Punctum saliens*, building, nourishing, and enlarging the rest of the body, (as we have shewed in our *History*) then

Ex. XLVII. doth operate, according to Arist. 241

Then it flowes from the Heart as from the Spring-head into the whole body.

Likewise if the Egge be therefore *Prolifical* because it hath a soul, or (as *Aristotle* would have it) a part of the *Vegetative soul*; it is plaine, that the *Punctum saliens*, and the *Genital animate part*, doe proceed from the *Soul* of the egge; (for nothing is the Author of it self) and that the soul is derived from the egge into the *Punctum saliens*, by and by into the *Heart*, and at length into the *Chicken*. de gen. an. l. 2. c. 4.

Adde to these, if the egge have a *prolifical vertue*, and *Vegetative soul*, by which it erects a *Pullus*; and do owe them (as it is plain it doth, and all men confesse it) to the seed of the *Cock*; it is then certain that this *Seed* is *Animate*: For so *Aristotle*: *Whether the seed have a soul or no; there is the same reason to be given for it as for the Parts. For no soul can be in any thing but in that whose soul it is; nor can there be any part which is not partaker of the soul: unless it be an equivocal part, as the eye of a dead man. That therefore the seed hath a soul, and a being in potentiâ, is clear.* Ibid. l. 2. c. 1.

It therefore follows out of what hath been said, that the *Male* is the *Primary Efficient*, in which *Ratio, & forma*, the Reason and Form is; which *Efficient* begets a *prolifical seed*, or *Geniture* rather, and that *Geniture* endowed with a *Vegetative soul*, (with which also its other parts are endowed) he doth transmit into the *female*. This *Geniture* being transmitted, it moveth the *Matter* in the *Hen*, that so an *Animate* egge may be produced; by which means the first partiele of the *Chicken* is animated, and afterwards the whole *Chicken*. So that according to *Aristotle*, either the same soul is conveyed by a *Metempsychosis*, from the *Cock* into
R his

his *Geniture*, from his *Geniture* into the substance of the *Hen*, from thence into the *egge*, and from the *egge* into the *Chicken*; or else is raised up in the subsequent by the precedent things, namely by the *Male*, in his proper seed; by the seed, in the *egge*; and at last by the *egge*, in the *Chicken*, *tanquam lumen de lumine*, as light derived from light.

The *Efficient* therefore which is sought for in the *egge*, from whence the *Chicken* is born, is a *soul*; and the *soul* of the *Egge*: for according to *Aristotle*, the *soul* is onely in that thing, whose *soule* it is.

Ibid.

But it is manifest that the *Seed* of the *Male* is not the *Efficient* of the *Chicken*, neither an Instrument, by whose motion the *Chicken* might be formed, (as *Aristotle* would have it) nor as an *Animate* substance, as if the *soul* were its *soul*. For in the *egge* there is no seed at all, either now touching it, or that ever did touch it, (and it is impossible that that should move, which doth not touch; or that any thing should be affected by that, which doth not move it) and therefore the *seeds soul* ought not to be said to be in it. And yet though the *soul* be the *Efficient* in the *Egge*, yet it doth not appear to be derived rather from the *Cock*, or his seed, then from the *Hen*.

Nor is it transferred by a *Metempsychosis*, or certain translation of the *soul* from the *Cock* and his seed, into the *egge*, and thence into the *Chicken*? For how can it be translated into the *Egges* that are yet to come, and to be conceived after *Coition*? Unless some *Animate* Seed do lurke in the *Hen* all the while; or else the *soul* onely without seed be translated, that so it may be afterwards infused into the *Egge* when the *Egge* shall be made. But neither of these is true. For the seed is

no where found in the *Hen* : nor is it possible that the *Hen* should after Coition possess two souls ; namely, her own, and the soul of the future eggs, and Chickens : for the *soul is never said to be, but in that whose soul it is* : much lesse can one, or more souls lye lurking in the *Hen*, that so they may attend the future eggs and *chickens* which are to be born in their order.

We have deduced these passages out of *Aristotle*, that from them it might appear, how the *Cocks* feed doth, according to him, produce the *Chicken* out of the *Egge*, that so some light might be afforded to this perplext disquisition. But seeing they do not explaine how this business is accomplished, nor yet salve his own objections ; we are still sticking in the same mire, and involved in the same doubts, (concerning the Efficient cause of the *Fetus*, in the Generation of Animals) nay to far are we from receiving any clear satisfaction, that we are rather more perplext, and to seek, then we were before. And therefore no wonder this excellent Philosopher was in the strights concerning this matter, and did therefore range together so many several sorts of efficient causes of Animals, and sometimes betake himself to examples drawn from *Automata*, things seeming to move of themselves, sometimes to coagulated matter, sometimes to Art, Instruments, and Motion ; sometimes to the soul in the *egge*, and in the seed of the Male, (to illustrate the thing) and where he seems to be positive and settle upon some determination, concerning what it may be, that should render the *Seed*, (be it of Plants, or Animals) fertile ; he renounces Heat and Fire, as improper Agents ; nor doth he admit any such like faculty ; nor can he find out any thing in the seed

it self, which should be fit for the undertaking; but is compelled to admit of a certain Incorporeal extrinsecal thing, which should (like Art, or the Minde) form the *fœtus* by wisdom and providence, and ordain and institute all things relating to it, to some end and purpose, and to its better subsistence. He takes, I say, sanctuary, in an obscure and ignote thing; namely, in a spirit contained in the seed and frothy substance, and a certain nature in that spirit answerable in proportion to the substance of the Stars. But what that should be, he no where reveals.

*Fabricius his Opinion concerning the
Efficient cause of the Chicken
is confuted.*

EXERCIT. XLVIII.

SINCE I have proposed *Aristotle*, the chiefeſt of the Old Philosophers, and *Hieronymus Fabricius ab Aquapendente*, an eminent Anatomist amongst the Modern, to be my Leaders, that from them I might chiefly be enlightened concerning the generation of Animals, and since I cannot better my self by *Aristotle*, I have resolved to set upon *Fabricius*, to see what account he can give of it.

Now he attempts to give resolution to three doubts arising in the case: namely, First, What is the Efficient of the Chicken? and that he concludes to be the Males seed. 2. How this appears in the egg to be so, and by what means the Cocks seed doth render

render the egge fertile? Lastly, In what Order are the parts of the *Chicken* procreated?

As for the first, it appears out of our *Observations*, that the *Cock* and his seed are indeed the *Efficient cause* of *Generation*, but not the *adequate cause*; but that the *Henne* also comes in for a share.

In this place therefore we must chiefly enquire, how the *Cocks* seed doth fructifie the *Egge*, and raise a *Chicken* out of it, which would else be *subventaneous*, and *impractical*.

But let us give ear to *Fabricius*: *Those creatures*, pag. 38. saith he, that are produced out of an egge, are different from those which are born out of seed; in this, that *Oviparous* creatures have a matter, out of which the *Chicken* is corporated, distinct and separate from the Agent: but *Viviparous* creatures have both the material and efficient cause adjoyned, and concorporated together. For the Agent in *Oviparous* creatures, is the seed of the *Cock* in the feathered kind, which neither is, nor can be in the *Egge*: but the matter out of which the *Chicken* is corporated, is the *Chalaza*. These two are much distant one from another; for the *Chalaza* is in the *Yolk* now formed, and fallen into the second *Uterus*, and is adjoyned intimately to the egge: on the contrary, the *Cocks* seed remains neer the fundament, and is removed from the *Chalaza* by a large chasme, and yet by its irradiating faculty it fructifies both the *Uterus*, and all the egge. But in a *Viviparous animal*, the seed is both the Matter, and the Efficient too, both being contracted into one body.

He seems to have introduced this difference between *Oviparous* and *Viviparous Animals*; that so he might countenance the opinion of *Physicians* concerning the *Generation of Man*, or at least not subvert it; who conceive that the seeds of both

Sexes, ejection together in *coition* are mingled, and according as the one prevails over the other, so the one approves it self the *Efficient*, and the other submits it self to become the *Matter*; so that they both conspiring together, do constitute the conception in *Viviparous Animals*.

But when he had observed, that neither *Seed* nor *Blood* is attracted by means of *coition* into the *womb* of the *Hen*, nor contained there, and could not believe, that any thing emitted from the *cock* in *coition*, could possibly arrive so farre, nor could finde any thing in the *Egge*, that is adjoined to the *males seed*, he was enforced to doubt, how the *seed* (which is no where present with, nor mingled amongst the *feminine geniture*, nor is adjoined to it, nor doth so much as touch it at all) should constitute the *Chicken*, or fructifie the *Egge*? especially when he had before delivered, that from some premised *coitions*, all the *eggs* that were to be layed that year, were made *prolificall*. For how could it chuse but seem impossible, that from the *seed* of the *cock* received in the *Spring* (but now departed, lost, and consumed) the posthume *eggs* (layed possibly in *Summer* or *Autumne*) should be rendered *fruitfull*, and produce *chickens*?

That he might rid his hands of this grand difficultie, he coined the fore-said distinction; and to ratifie his opinion, he adds three farther Assertions: First, that though the *cocks seed* were neither in the *Egge*, nor at any time in the *Womb*, nor adjoined to the *material cause*, (as it is in *Viviparous Animals*) yet it continues for a whole year in the *hen*. Secondly, to reserve this *seed* in, he invents a dark perforation, neer the door of the *Womb*, wherein the *cock* should deposite his *seed*, and in which (as in a *pouch*) it should be concluded:

ded ; that thence all the eggs might receive their fertility. Lastly, though the seed in that pouch, neither touch the womb, the egge, nor the Ovary, that by that means it might fructifie the egge, or raise a *Chicken* out of it ; yet, he saith, that it gains addressees into the very egge, by the insinuation, or irradiation of a certain spiritual substance in it, and by those arts doth fructifie the *Chalaze*, and so model a *Chicken*. And yet by that assertion he seems to confirme *Aristotles* opinion (who assures us that the female contributes the matter, and the male the efficiency to generation) which is contrary to the *Physitians* position concerning the commixture of seeds : for whose sake he seems to have introduced his fore-said distinction between *Oviparous*, and *Viviparous Animals*. And that this his opinion may seem more probable, he recites what changes and alterations the seed reserved in the *Testicles* and *seminary Vesicles*, not yet emitted, doth procure in *Animals*.

But to take no notice that all this makes little to his purpose : (for the question in chief is not, How the *Cocks seed* doth render the egge fertile ? but rather, How it doth frame and erect a *Chicken* out of the Egge ?) all those things which he hath conjured up to guard his opinion, seem for the most part false, or very suspicious ; as appears by our Observations delivered in this *History*. For neither is that blinde perforation in the root of the rump (which he calls the *purse*, or *pouch*) destined to cubbard up the *Cocks seed*, nor is there (as we have said) any seed at all found in it : but it is an empty unprovided thing both in the *Cock*, and *Henne*.

But what he would have by his spiritual substance, and irradiation, he is yet to acquaint us, as

also what substance hee understands that to be, which he affirms, doth by its virtue vivifie the eggs. Whether a *corporeal*, or *formal* substance, which should proceed from the irradiation of the *seed*, (which lies at roost in the *pouch*) and (which is chiefly required) should fashion the *Chicken* out of the *egge*.

To conclude, in my minde, he saith no more in substance then this : *It makes the Chicken, because it irradiates the Egge ; and forms it, because it vivifies it :* and so he labours to reveal and illustrate the obscure manner of formation, by one more obscure then it self. For the same scruple returns entire ; namely, how the *Cocks seed*, a meer *non-tangent*, an *external efficient*, and disjoyned by place, remaining in the *pouch*, can fashion the interiour parts (that is, the *Heart, Liver, Lungs, and Guts, &c.*) in the *egge* out of the *Chalaza*, by *Irradiation* ? Unless he will have it sitting in its chair of State, like the Creator of all, only by this word of command, *Fiant*, Let all things be so ; (namely the *Bones* for *Support*, the *Muscles* for *Motion*, the *Organs* for *Sense* ; the *Members* for *Addition*, the *Intrals* for *Concoction*, and the like) and so order, and by its beams or influence constitute all things to their proper end, with providence, wisdom, and art. For neither doth *Fabricius* expound the manner, nor yet demonstrate the *seed* to be of such force and virtue, that (without coming neer) it can effect all this ; especially since an *egge* can, by *Incubation* of a stranger fowle, or any other fostering warmth ; as in *dung*, in a *mat*, or an *oven*, though never so remote from the *pouch* of its own *mother-ben*, be quickened, and produce a *fetus*.

The same difficulty therefore lyes still upon our hands ; namely, How the *Cocks seed* is the *Efficient cause*

cause of the Chicken? nor is it any whit salved by the influence of this spiritual substance. For though we should grant, that the *seed* is reserved in the *purse*, and that by a *Metamorphosis*, and *Irradiation*, it did incorporate the *chicken* out of the *Chalazæ*: yet the scruple would stick no less by us; namely, How the *Intrals* of the *Chicken* are modelled. But these things are long since confuted by us.

Wherefore, when we are in quest of the *efficient cause of the Chicken*, we must look for it in the *EGGE*, and not dormant in a *pouch*; and for such a one, which, though the *egg* now grown stale, were distant many miles from the *Hen*, and laid under an other *Hen* (as a *Turkey-hen*, or *African-hen*) to be hatched; or (as in *Ægypt*) under warm *sand*, or *dung*, or in an *Oven* proper for the purpose, would still raise up a *chicken*, of the same *species*, and very like the *Cock* and *Hen* that were its *natural parents*; or else (in case the *Cock* were of a different kinde) a mungrel of-spring, of a mixt *species*, and resemblance.

Wherefore the knot remains to be untied, which neither *Aristotle* nor *Fabricius* have loosened; namely, How the seed of the *Male*, or *Cock*, doth produce the *chicken* out of the *egge*, or is to be named the *Efficient cause* of the *chicken*, especially, since it is neither present, tangent, nor adjoined to the *EGGE*? And though almost all men conclude, that the *Male*, and its *seed* are the *Efficient cause* of the *Fætus*; no man yet hath sufficiently declared, how it can be done, especially in our *Hen-egg*.

*The Efficient cause of the Chicken,
is hard to be found out.*

EXER. XLIX.

The disquisition of the *Efficient* is exceeding difficult; (as we have said) and that the rather, because so many names are attributed to it. Whereupon *Aristotle* doth recount very many *efficient causes* of *Animals*: And many controversies are risen amongst authors; chiefly, between *Physitians* and *Aristotelians*, who contend very earnestly about it; endeavouring by different opinions to explain both the *Efficient cause*, and the manner of its *Efficiency*.

And indeed the *Omnipotent Creator*, doth in none of his works more manifestly reveale the presence of his Deity, then in the Fabrick and Structure of *Animals*. And though it be a known thing, subscribed by all, that the *fetus* assumes its original and birth from the Male and Female, and consequently that the Egge is produced by the Cock and Henne, and the Chicken out of the Egge: yet neither the Schools of *Physitians*, nor *Aristotles* discerning Brain, have disclosed the manner, how the Cock and its seed, doth mint and coine the Chicken out of the Egge. For it is evident enough, by what we have delivered, concerning the Generation of *Oviparous Animals*, and others, that neither the Opinion of *Physitians*, deducing Generation from the mixture of the Seeds of both Sexes, nor *Aristotles* neither, establishing the seed of the Male for the *Efficient*, and the Menstruous Blood for the *material Cause*, are to be embraced:
because

because that neither in *Coition*, nor presently upon *Coition*, any thing doth part from the Female into the *Cavity* of the *Uterus*; out of which, as out of the *Matter*, any thing relating to the *Fetus* should be suddenly produced: nor doth the *Geniture* of the Male (whether it be animate itself, or an animate Instrument) enter into the Womb, or is attracted thither, or any where else reserved in the Female, but doth either vanish, or retract: nor is there any thing else to be found in the *Uterus* presently after *Coition*, which issuing either from the Male or Female, may be fancied to be the *Matter* or Original of the future *Fetus*. Nor is the Cocks seed surviving in *Fabricius* his Pouch, or any where else in the Henne; that thence, either by the *irradiation* and influence of *spiritual* substance, or by *contact* the *egge* is made, or a *Chicken* out of the *Egge*. Nor doth the *Hen* contribute any other *seed*, then the *Papu'e*, the *Yolk*, and the *Egge*. And therefore the contemplation is rendered more intricate by our *Observations*; because by them all those suppositions, upon which both the other opinions were supported, are thrown down to the ground. But especially, when we shall anon demonstrate, that all *Animals* are alike generated out of an *Egge*; and that in *Coition* (whether of *Viviparous*, *Brides*, or *Men*) no *Seed* or *Blood*, proceeding from either *Male* or *Female*, is entertained in the *Hollow* of the *Womb*, or drawn up thither before *Coition*, or in *Coition*, or after *Coition* is found in the *Womb*, which may be conceived to be the *Matter Efficient*, or *Principle* of the future *Fetus*.

Daniel Sennertus, a late learned Man, and a careful Inquirer into *Nature*, having first ballanced other mens opinions, attempts at last to resolve
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the business; concluding that the *Soul* is in the *Seed*, and that it is the very same *Soul* with that, which afterwards informs the *Infant*: so that he makes no scruple to affirm that the *Rational soul of man*, is present in his *Seed*: and that therefore the *EGGE* possesses the *Soul* of the *Chicken*: and that the soul is conveyed with the *Seed* into the *Womb* of the *Female*: and from that seed of both *Sexes* conjoined (as one flame to another) but not mixed (for mixture, saith he, respects things of diverse Species) but indowed with a *soul*, a perfect *Animal* doth result. And therefore, saith he, the *Seed* of both *Sexes* is required, both to the constitution of an *Infant*, and of an *egge*. And thus, (like one that had subdued all difficulties) He conceives, he hath delivered a certain and perspicuous Truth.

But, granting that there is a *Soul* in the *egge*, and that *soul* united and made up of the *souls* of the *Parents*, and sometimes proceeding from *Parents* of of several kinds, as from a *Mare* and an *Ass*, from a *Dunghil-Hen* and a *Cock-Pheasant*; and that it is not *Mixed*, but *United*; and that the *Chicken* (after the manner of the *Seed* of *Vegetables*) is made by that *efficient soul*, being afterwards preserved by it, all its life long: so that it be counted absurd to affirm, that the *fetus* is cherished by one soul out of the *Uterus*, or *egge*; and by another in the *Uterus* or *egge*: suppose, I say, we grant all this (though it be invalid, and doubtful) yet our *History* of the *Generation* out of the *EGGE*, doth utterly subvert, and confute as false the very foundation and basis upon which all his doctrine leans, and relies: Which is this, That the *egge* is constituted of the *Seed* of *Cock* and *Hen*: or, that the seed is transmitted from both into the *Uterus*: or
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Ex.XLIX. *is hard to be found out.*

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that the *fatus*, or any part of it is formed of the seed so entertained by the *womb*, or cast into it : or, that the *seed* of the *Cock* (as an *Efficient cause*, or *Operatour*) is any where reserved in the *Hen*, which (as he conceives) draws *matter* and *nutriment* from her into the *Womb*, to support the *fatus* which it hath made. For the conditions which he himself according to *Aristotle* reputes necessary, will be found wanting : namely, that the *fatus* ought to be made of that which actually is in being, and doth pre-exist : and that the *Chicken* is nourished by that which is present with it, and in the same place where it self is first constituted : As also, that it should be made by that which doth operate being immediately conjoyned to it ; and ought to be the same thing, by which the *chicken* is preserved, and augmented all its life-time. For the *cocks seed* (whether *Animate*, or *Inanimate*, it matters nothing) is not at all in the *Egge*, nor in the *Uterus*, present, and conjoyned ; nor in the *matter* whence the *chicken* is framed, as neither in the *Chicken* it self now begun, that so it may either frame, or perfect it.

He miscarries likewise, when he goes about to illustrate his opinion concerning the *Animal seed*, by allusion to that of *Plants*, and *Mast* : because he did not understand the difference alledged by *Aristotle*, between the *Geniture* proceeding by *coition*, and the first conception made out of both Sexes ; nor did observe that an *egge* might be first conceived in the *Cluster* of the *Vitellary* (without the translation of any *Geniture* from Male and Female into the *Uterus*.) Nor did he apprehend that the *Uterus*, even for some time after *Coition*, is quite void of any *matter* at all, either transmitted from the *Parents*, or made by *Coition*, or occasioned

caſioned any other way. Nor had he read, or at leaſt obſerved *Fabricius* his experiment; namely, that after ſome *Coitions* of the *Cock*, the *Hen* may be ſo fructified, that from that time for the whole ſucceeding year ſhe may lay all *Prolifical Eggs*: though ſhe have not in the interim converſed with the *cock*, whereby each particular *egge* might receive ſecundity; nor yet retained ſo long the ſeed ſhe formerly received.

This is agreed upon by univerſal conſent; that all *Animals* whatſoever, which ariſe from Male and Female, are generated by the *coition* of both Sexes; and ſo begotten as it were *per contagium aliquod*, by a kind of *contagion*. In like manner as *Phyſitians* obſerve, that contagious diſeaſes (as the *Leproſie*, the *Pox*, the *Plague*, and *Pibifick*) do propagate their infection, and beget themſelves in bodies yet ſound and untoucht, meerly by an *extrinſecal contact*; nay ſometimes onely by the *breath*, and *perμίαιμα*, by *inquinatıon*; and that at a diſtance, through an inanimate *medium*, and that *medium* no way ſenſibly altered. So that, that which had the firſt touch, begets an *Univocal* like it ſelf, not as touching at this inſtant, nor yet now actually in being, nor as preſent, or conjoined, but meerly becauſe it once hath touched. Of ſo great operation and energy is *Contagion*. And perhaps the ſame thing obtains in the *Generation* of *Animals*. For *Fishes* egges, which acquire their growth abroad at their own diſpoſe, without any *Male-ſeed*, (and therefore do without all doubt live without it) being beſprinkled with the *Males* *proliſical milkey ſubſtance*, and onely tinctured from without, do generate *fiſhes*. Tis not, I ſay, an intromiſſion, or intimate reception of the maſculine ſeed into each particular *egge*,
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which sets it a work about the fabrick of bodies, or introduces the soul, but a bare contact. Whereupon Aristotle calls *lac maris*, the Males milk, or genital seed cast into water, sometimes genital, and propagating liquor: and sometimes Vital Venom. For saith he, *The Masculine fish sprinkles the egges with genital seed, and those egges which that Vitale Virus, Vital or quickning Venom touches, out of them are born fishes.* It being therefore laid down as an undoubted principle, that the *fatus* is made by Contagion, there will a weighty doubt arise; namely, how bare Contagion can be the author of so great a work? and how the parents can by that generate issues like themselves; or the males seed produce an *Univocal* like that creature from which it proceeded? since after contact it bids adieu, and is no longer in being, or touching, or present at all, but clean corrupted, and a *Non-ens*. How, say I, can a *Non-ens* act? or a *Non-tangens* erect a fabrick like it self? or that which is dead it self, impart a life to another thing, and meerly upon this account, that the time was when it did touch.

For Aristotles argumentation seems false, or lame at least, where he contends: *That Generation cannot be without an Agent and a Patient: and those things cannot act and suffer, which do not mutually touch each other: but those things do mutually touch, which having each their particular magnitude and place apart, have their extremities meeting one another.*

But since the case is plain, that Contagion (where the things touch not, nor have their extremities kissing one another) can destroy living creatures, what should hinder, but that it should be as powerful, to conduce to the life and generation of animals.

mals. ? The Efficient in an Egge, by a *plastral vertue* (because the male did but onely touch, though he now be far from touching, and have no extremity reached out towards it) doth frame and set up a *fetus* in its own species and resemblance. And this author of fecundity, this peir-
 ing power is translated through so many *mediums* or *instruments*, that one cannot pattern it, neither by that mutation procured by instruments (as in the productions of Art) nor by *Aristotles Automata*, nor our *Clocks* or *Watches*; nor by the instance of a *King* in his own dominions, where his command is every where a law; nor can you ratifie this our doctrine, by introducing a soul into the seed or geniture.

And hereupon many controversies, and problemes are started concerning the attractive power of the *Load-stone* and *Jet*: concerning *Sympathy*, and *Antipathy*, concerning *Poyson*, and the contagion of *pestilential diseases*: concerning *Alexipharmacal Medicines*, and such as cure or kill from an *occult* (or rather *ignote*) quality and propriety: all which seem to execute their pleasures without any touching. And chiefly this. What is there in generation, that by a momentany touch (nay not touching at all, unlesse through the sides of many *mediums*) can orderly constitute the parts of the *Chicken* by an *Epigenesis*, and produce an *Univocal creature*, and its own like? and for no other reason, but because it touched heretofore. How, I say, can that which is not present, and did onely touch outwardly, constitute, orderly dispose and limne all the members of the *Chicken*, in an egg which is now exposed to the wide world, and oftentimes transported a great way off. For nothing can make and generate it selfe into anothers likeness.

What the Efficient cause of Animals is ; and what its Conditions.

EXERCIT. L.

THat therefore we may in some proportion dive into the knowledge of the efficient cause, (so far forth as concerns our present contemplation) we must take notice first of the *Instruments* or *Mediums* which pertain to the *efficient* or *forming cause* : and into this rank is the *Male* and *Female* for to be reduced ; likewise the *Geniture*, and the *egg*, and its first rudiment. For some males (and females too) are *barren*, or *unfruitful*. And likewise the *males geniture* is sometimes more, and sometimes less fertile : for the *Semen Virile* as it is barely contained in the *Seminal Vesicles* (except it be rarified into froth by the spirits, and forceably leap out) is *unfruitful*. And this too, possibly is not always successful. Nor are the *Papula*, or *Yolks* bred in the *Cluster* of the *Ovary*, or the *Egges* contained in the *Womb*, all presently fruitful.

Now I call that *fruitful*, which (except some impediment happen from without) will attaine its designed end, by the *efficient power* implanted in it, and compass that, for whose sake it is ordained. So that *Cock* is reputed *fertile*, who causes his *Hens* to lay oftner, and more constantly, and also renders their *egges generative*.

So likewise that *Hen* is *fruitful*, which is useful in laying *egges*, and hath a good retention in order to the *prolificial* vertue imparted to her from
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the *Cock*. So the *Cluster* of the *Papulae*, and *Ovary* it self are counted fertile, when they are well fraught with store of *rudiments* and *foundations* of *egges*, and those mature.

Likewise that *egge* is fertile, which is farthest from being *subventaneous* or *addle*, and doth less faile in producing a *Cbicken*, howsoever you dispose of it, either to *Incubation*, or any other fostering-hear.

Therefore such an efficient of the *Cbicken* is required, as may impart virtue to all these, by which they may be fructified, and obtain an efficient power; for the same thing, or at least something proportionable to it, is in them all, bestowing *secundity* upon them. And the *Inquiry* is the same, namely, what it is in the *Egge*, that renders it fertile: what in the *Ovary*, and what in the *Papula*; likewise what in the *female*, and lastly in the *seed* and *Cock* himself, &c. What in the *Blood*, and *Punctum saliens*, or first genital particle, from whence afterwards the *rise*, *fabrick*, and order of all the other parts is derived: as also, what is it in the *Cbicken* it self, from whence it grows sturdy and active, attains its youth and maturity, lives a healthy life, and a long.

Nor is that inquiry unlike this, which demands, what both *male*, and *female* (*Cock* and *Hen*) confer to the fertile *egge*; or what it is which proceeds from both, towards the *perfection* and *similitude* of the *chicken*; as whether the *egge*, *conception*, *matter*, and *nutriment* proceed from the *female*, and the *Operative* virtue from the *male*; whether a certain *contagion* sent forth by *coition*, or created by it, or received from it, remaining in the *Hen* or *Egges*, work upon the matter of the *egge*; or attract a nutriment from the *Hen*, concocting
and

and distributing it, to the encrease of the *egge*, and afterwards to the production of the *chicken*: Or lastly, whether all that which relates to the *form*, *soul*, and *fecundity*, do proceed from the *male*; but from the *female*, whatever relates to the *matter*, *constitution*, *place*, and *sustenance*. For in *animals* (whose *Sexes* are distinct) it is so contrived, that because the *female* cannot alone generate, nourish, & protect the *fetus*, the *male* is joined as yoke-fellow in the task (as the Superior, and more eminent *progenitor*) to supply her failings; and so to correct the infirmity of the *Subventaneous eggs*, and inspire them with fertility.

For as a *chicken* born of an *egge*, is indebted to that *egge* for his *body*, *soul*, and *principal* or *genital part*: So is the *egge* for all it has, to the *Henne*; and the *Henne* also for her *fecundity* to the *Cock*.

But whether the *male* be the first and principal cause of the *progeny*, or whether the *male* and the *female* are intermediate and *Instrumental causes* set awork by *nature*, or the first and *Supreme Genitor*, we have here an occasion offered to enquire; and it is a very worthy and necessary one, because all perfect science depends upon the knowledge of all causes: and therefore to the plenary comprehension of *Generation*, we must ascend from the last and lowest efficient to the very first and most *supreme*, and know them all.

But as for the first and *bighest Efficient* of the *chicken*, we shall determine what that is afterwards, (when we treat of the *Efficient* of all other *Animals*) but what kind of one it is, we will here declare.

The first *condition*, or *qualification*, of the first and *primary Efficient* properly so called, is, that

it be the first & principal fructifier, from whence all intermediate causes assume their derived fecundity. For instance, the chicken is derived from the *Punctum saliens* in the egg, not only in regard of its bulk, but also, and that chiefly in regard of its soul; the *Punctum saliens*, or Heart is derived from the egg, the egg from the Hens, and the Hens fertility from the Cock.

Another requisite or condition of the primary Efficient is desumed *ex opere facto*, from the production it self, viz. the Chicken: because that is the prime efficient, in which the reason of the effect doth chiefly appear. But because every Generative efficient doth generate its like, and the issue is of a mixt nature; the first efficient must needs be mixt too.

Now I therefore pronounce their issue to be of a mixt nature, because, the mixture of both parents is resulgent in it, both in the figure and lineaments of the body, and all its parts; as in complexion or colors, moles or spots, diseases, and other accidents of the body. Likewise in the soul and actions, and functions (as in like manners, docility, gate, and voice) such a kinde of temperature is discoverable. For as we say that a similar mixt body is made of the Elements, because their virtues, heat, cold, moisture, and secity, are found compounded in the same similar body: so likewise the paternal and maternal bandy-work may be tracked and pointed out both in the body, soul, and other accidents of the Chicken: (which follow the temperature, or happen unto it) for instance; In a Mule, the soul, body, manners, and voice of both parents; (viz. of the Mare, and the Ass) are apparent. So also in those Chickens which are the Offspring of the dunghill-hen, and Cock-Pheasant: and in that mungrel Curre, which is produced by the sodomie of a Wolf and a Bitch.

Since therefore the Chicken resembles both pa-
rents,

ments, and is a mixt Effect: the generant primary cause (which it resembles) must needs be mixt likewise. Therefore that which frames the *Chicken* in the *EGGE* is a mixt nature (as being united, or compounded of both) and the work of both parents. And if any contagion do arise or remain in the female upon coition, (in which they two are mixt, and become as it were one *Animal*) that also will be of a mixt nature or power, by which the *egge* shall afterwards become fertile, and achieve a *plastical* virtue, which is an Agent of a mixt nature, or a mixt efficient-Instrument, producing a *Chicken* of a mixt nature also.

The contagion, I say; because *Aristotles* perswasion is altogether refractory to experience herself: namely, where he saith, that some part of the *Fœtus* is instantly made upon coition. Nor is that true neither, which some of the *Moderns* averre, namely, that the soul of the future chicken is in the *egge*: for that is no whit the chickens soul, which is in no part of the chickens body. Nor can the soul be said either to be begotten, or left behind presently upon coition: for otherwise there should be two souls in a *Woman* with child. Therefore till it be determined what the efficient of the *egge* is, which is of a mixt nature, and ought to remaine present upon coition: give me leave to call it contagium, Contact, or contagion.

But where the contagion lurks in the female after coition, and how it is communicated and derived to the *egge*, requires a more exact Disquisition: and we will afterwards fall upon it, when we treat generally of the conception of females. It shall suffice, in the mean time to have taken notice, that it must needs be the fate of the first efficient (in which the reason of the future off-spring doth abide

bide) that, since its off-spring is mixt, to be of a mixt nature it selfe; and either to proceed from both Parents, or from something which makes use of both (as animate Instruments, cooperative, and mixt, and moulded into one by coition.)

The third condition of the Primary Efficient is, that either it impart motion successively to all its intermediate instruments, or else employ them otherwise, but that it selfe be subservient to none: whence a doubt arises, whether the Cock be the Primary Efficient in the Generation of the chicken, or have any before, or superior to him. For all generation seems to be derived from Heaven, and issue from the motion of the Sun, and Moon. But we will be positive in this matter, when we have first declared, what an instrument, or the instrumental efficient cause is, and how divided.

Now Instrumental Efficients are of diverse kinds; some, according to Aristotle, are *factiva*, Making, and some, *activa*, Doing; some do not operate, but when they are conjoyned with a prior efficient, as the hand, foot, and genital parts; others operate, disjoyned, as the Geniture and the Egge: some Instruments have not motion or action, but what is given them by the first Efficient; others have proper internal principles of their own, to which nature affords no motion in generation, but yet employs their faculties, and sets them the rule, and law of their performances; as the Cook employes fire, and the Physitian herbs, and the virtues of medicines to cures.

Sennertus, to maintain his conceipt, concerning the soul in the Seed, and the formative faculty in the Egge, affirms, that not onely the Egge, but the Cocks seed also, is indowed with the soul of the future Chicken, and is not the Instrumental Agent, but the

the *principal*; absolutely denying that any separate *Efficient*, is *Instrumental*: but pronouncing, that onely that is to be reckoned an *Instrument* in propriety of *speech*, which is conjoined with the *primary efficient*: and that, that onely is an *Instrumental efficient*, which hath no other *motion*, or *action*, then that which is immitted, or continually and successively received from the *primary efficient*, by whose power it acts. And upon that account, he rejects the instance concerning things cast or hurled, which receiving their force from the thing that doth *burle*, do yet notwithstanding move, even when they are separated from it. As if the *Sword* and *Speare* were to be counted *Instruments* of War, but not *Arrows*, and *Bullets*. Hee also rejects the instance drawn from a *Republick*, and denies that the *Magistrates*, *Counsellors*, or *Officers* of a *Common-wealth*, are the *Instruments* of a *Nation*: And yet *Aristotle* reckons a *Counsellor* for *Polit. l. i.* an *Efficient*, and calls an *Officer* an *Instrument*, in plain termes. He likewise decries the instance of the *Automata*, and many other things, that so he may ratifie the *seed* (or *egge*) to be *Animals*, and not an *Instrumental*, but a *Principal Agent*. And yet (as if he were enforced by the truth) he laies down such conditions for a *Principal Agent*, as do absolutely prove contrary to his own fore-mentioned opinion. *Whatsoever produceth a work, or effect more noble then it selfe; or else an effect like to it selfe, is not an Efficient, but an Instrumental cause.* Which being granted, who will not conclude, that *Seed* and an *Egge*, are *Instruments*? Since a *chicken* is an effect nobler then the *egge*, and neither like an *Egge*, nor *Seed*. Wherefore, when this most Learned Man denies the *Seed* or *Egge*, to be an *Instrument*, because they are separated from

the *Primary Agent*, he stands upon a false bottom. For since the first *generant* produceth its off-spring by several *mediums*, whether any of those *mediums* be conjoined to it, as the *Hand* to the *Artist*; or whether it be separated from it, as the *Arrow* shot from the *Bow*; yet both are called *Instruments*.

From these recited *conditions* of the *Instrumental cause*, it may seem to insue, that the *cock*, or at least the *cock* with the *hen*, are the *Primary efficient*s in the *Generation* of the *chicken*: for the *chicken* is like them; nor can it be thought to be more noble then its *Efficients* or *Parents*. I shall therefore adde one condition more to the *Primary efficient*, by which perhaps it may appear that the *Male* is not the *Primary*, but the *Instrumental cause*; namely, that it is required of the *Primary efficient* in the *fabrick* of the *Chicken*, that he employ *Skill*, *Providence*, *Wisdom*, *Goodness*, and *Understanding*, far above the *capacity* of our *rational soules*; as that, in which the *Reason* or *Idea* of the *future work*, ought to consist, and which ought likewise to act for some destined end, disposing and perfecting all parts, forming the smallest and most inconsiderable *appendixes* of the *Chicken* for some use, and employment: not providing onely for the *structure* of the creature, but for its *wellfare*, *ornament*, and *defence*.

Now the *male*, or his *seed*, either in, or after *coition*, is not so qualified, that *Art*, *Understanding*, and *Providence*, may be attributed to it.

Which things being pondered, the *Male* seems to be an *Instrumental efficient*, as well as his *seed*, and the *Hen* likewise as well as the *Eggs* she laies. And therefore we must take our flight to a more *Primary*, *Superior*, and more *excellent cause*; to which we may justly attribute *Providence*, *Understanding*,

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Art, and Goodness; and such a one as is as much superiour to its effects and Workmanship, as an Architect is better then a Barn he sets up; a Prince then his Officers, or an Artist, then his owne hands.

And therefore both Male and Female are but Instrumental efficients, subservient to the high Creator, or Protogenitor. And in this sense it is truly said, that the Sun, and Man, beget an Animal, because the Spring and Autumn do insue upon the Approaching and Receding Sun, at which times commonly, the generation and corruption of Animals happen. So the chiefeſt of Philosophers. The first Movers motion is not the cause of generation and corruption, but the motion of the Oblique circle: for that is continual, and hath also two Motions: for if generation and corruption were to be always continual, it were necessary that something should be always moved, least those mutations should fail; but yet it must have two motions, least one onely of the two mutations should succeed. The cause therefore of the continuity is the motion of the Universe, but the declivity it selfe is the cause of the Approach, and the Recesses. For it comes to pass, that He, (namely the Sun) is sometimes nearer, and sometimes farther from the earth. And when the Interval is inequal, the motion must be inequal too. If then he therefore generate because he approaches nearer: and cause corruption, because he removes and recedeth farther from the earth: Then it follows that if he often do generate, it is because he often approacheth: and if he often cause corruption, it is because he often recedeth. For contraries have contrary causes.

And therefore in the Spring all things flourish and grow; (namely, from the Approach of the Sun, who is the Common Father, and Parent: or

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at least the immediate and Common Instrument in Generation imployed by the *high Creator*) and that not *Vegetables* onely, but *Animals* too: nor they onely which are *Spontaneous* issues, but those also which are generated by *Male* and *Female*. As if at the approach of this noble Planet, soft *Venus* did descend from the *Skie*, with *Cupid* and the *Graces* entertained for her *Retinue*, inciting and provoking all living things, by their *Aleageance* to *Love*, to propagate their kind. Or (as it is in the *Fable*) as if *Saturne* did then become an *Eunuch*, and threw his *masculine evidences* into the *Sea*, to raise a *Foam*, which might give birth to *Venus*: For in the Generation of *Animals*, *Superat tener omnibus humor*; *A gentle dew doth moisten all* (as the *Poet* hath it) and the *genital parts* doe foam and strut with *Seed*.

And therefore the *cock* and *Hen* are chiefly fruitfull in *Spring*, as if the *Sun*, or *Heavens*, *Nature*, the *Soul* of the *Universe*, or the *Omnipotent Deity* (for these are *Synonyma's*.) were a *Superiour* and *Diviner* cause of Generation then they. So, *Sol & homo generant hominem*; The *Sun*, and *Man* beget a *Man* (that is to say) the *Sun* by *Man* as its *Instrument*. And so, the *Creator* of all things, and the *cock*, beget an *egge*, and out of an *egge* a *chicken*: namely, by the constant *approach* and *recesse* of the *Sun*: who according to the will, and decree of the *Almighty*, is employed in the generation of all things.

We conclude therefore that the *male* (though he be a *Primary* and more excellent efficient then the *female*) is only an *Instrumental Efficient*: and doth himselfe, no less then the *Female*, owe his *fecundity*, or *generative Virtue* to the *Sun* his *Creditour*: and therefore the artifice and providence (which

(which we discover in his workmanship) doth not proceed from him, but God. For the Male uses neither counsel, nor understanding in generation: nor doe Men generate by any part of their reasonable soule, but by a faculty of their vegetative: which is not inrouled amongst the primary, and more divine powers of the soule, but the meanest, and basest.

Since therefore in the structure of a chicken, Art and Providence are no less visible, then in the Fabric of Man himselfe, and the creation of the Universe: we must needs acknowledge, that in the generation of Man, there is an Efficient cause more excellent then man himselfe: or else that the vegetative faculty, or that part of the soule, which raiseth this pile of man, and doth conserve it, is much more divine and excellent, and doth more personate the Image of God, then the Rational part it selfe: whose worth and dignity we more cry up, then all the faculties of the soule beside; though she were Regent and Emperess of the rest, and held them all as Tributaries to her. Or at least wee must confess, that there is neither prudence, nor skill, nor understanding in the workes of Nature, but they seem such onely to our apprehensions, who iudge of the divine productions of nature, by our owne Arts, and Faculties, (or copies drawne by our own fancies) as if the active principles of Nature did so produce their effects, as we do our artificial issues: namely by consultation, and rules desumed from the Minde and Intellect. But Nature, which is the Principle of Motion and Rest, in all those things wherein she is: and the vegetative soule, which is the primary Efficient cause of every generation, doe move and act by no acquired faculty (as we doe) which may be distinguish-

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ed by the name of *Art*, or *Providence*, but work by a certain *Destiny*, and *Mandat* according to rule, after the same manner, and constraint, as *light things* fly up, and *heavy* press downwards. The *Vegetative faculty* of *Parents* doth generate, and the *seed* arrives at last at the forme of the *fetus*, after the same manner as the *Spider* spreads her *Net*, the *Bees* and *Ants* build their *Cottages*, and furnish their *store-houses* for future exigence; *Birds* compile their *Nests*, *hatch*, and protect their young: namely, *Naturally*, and by their *Mother-wit*; not by any *discussive providence*, *discipline*, or *consultation*. For that which is in us the *Principle of Artificial operations*, & is called *Art*, *Understanding*, or *Prudence*: is in those *natural effects*, *Nature*, (which is *doctress*, her own *Tutor*, and taught by no man) and what is acquired, and a purchase in us, is in them inbred, and a Birth-right. And therefore they who look back to *Art*, are incompetent and partial *Judges* of *natural things*: for we are rather to judge of the contrary, and compare artificial productions to their *Sampler in Nature*. For all *Arts* are attained by an imitation and personating of *Nature*; and our *Reason*, or *Intellect* is derived from the divine *understanding*, exercised in its works. And when it is rooted in us by a compleat habit, like another adventitious acquired *soul*, reflecting a resemblance of the highest and divinest *Agent*, it produceth like effects and operations.

Wherefore (in my opinion) he is the right and pious *Philosopher*, who deduceth the *generations* of all things from that *eternal* and *Omnipotent Deity*, upon whose pleasure the *Universe* dependeth. Nor do I think we ought to contend, by what notion we call, or adore this first *Agent*, (to whom all the

the names of veneration are most due) whether that of *Deus*, or *Natura naturans*, or *Anima mundi*. For all men understand him to be that Beginning and End of all things, which is Omnipotent, and everlasting, the Author and Creator of all things, preserving, and perpetuating the fluxibility of mortall creatures, by the several vicissitudes of generations: which being every where present, is no less assistant to the particular operations of natural things, then of the whole Universe; that so he may propagate all Animals by his Deity, Providence, Art, and divine Understanding. Whereof some are spontaneous births, without any Univocal efficient; some born by the associat operations of male and female, some from one Sex onely; others by other intermediate Instruments, which Instruments are sometimes fewer, sometimes more, sometimes univocal, and sometimes equivocal, and *ex accidenti*, casual.

But all natural bodies whatever are both the productions, and Instruments of that Great God; and are either onely natural, as Heat, Spirit, the tepidity or warmth of the Air, or Putrefaction, &c. or animate also; for he makes use in some sort of the motions, faculties, and souls of animals themselves, in order to the perfection of the Universe, and precreation of Animals.

It appears therefore in some proportion; what the males contribution is towards generation; namely, the cock brings that same virtue to the egg, by which of a *subventaneus* it becomes a fertile one, as vegetable Fruits borrow from the Summer heat to ripen themselves, and fructifie their seeds; and which induceth fertility into spontaneous productions, by which from worms they become a Canker-worm, and from a Canker-worm, they become the worm called *Aurelia*, and from an *Aurelia*,

lia, Butterflies, common Flies, and Bees, &c. And in this manner the *Sun* by his access to the earth, is the Beginning of the motion and transmutation in the Increase of Fruits; and the End also, when he becomes the author of the fertility of their Seeds. And as in the early Spring he is the primary efficient of Leaves, Blossoms, and Fruits, so is he the last compleater of the maturity and fecundity of the Seed in the strength of Summer. For confirmation of which, amongst many other observations, I shall insert this one: There are some amongst us who manure their *Orange-trees* with a great deal of care and husbandry; so that the *Oranges* which the first year grew to the bigness of the top of ones thumb, are the next Summer mature and complete, save onely that they have no kernels, or seeds. While my thoughts were bent upon this contemplation, I fancied these *Oranges* to be a Specimen of the *Subventaneous* eggs, which are produced by the *Hen*, without the *Cocks* assistance, having all the sensible appearances or requisites of fruitful eggs, bating onely the fecundity, or propagating seed. As if the same thing were conferred by the *Cock* upon a *subventaneous* egg, to make it fruitful, which the *Sun* contributes in hotter climates, whereby the fruit of their trees are produced with kernels. And as if the *English Summer* were no farther usefull to some fruit, then the simple *Hen* to the *Eggs*, and were onely like the female, an impotent progenitress: which Summer in other Countries, where they enjoy a greater bounty from the *Suns* presence, were a masculine Summer, and did complete her productions.

This, by the by, that by the eggs example it might appear, what qualifications are required to a primary efficient in the generation of Animals.

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For it is clear, that there is in an egg an operator (and also in every conception, and rudiment) which is not only infused into it from the *female*, but is first communicated from the *male* by the *geniture* in *coition*, but yet first of all contributed to the *Male*, from the *Heavens*, the *Sun*, or the *Almighty Creator*. It is likewise manifest, that this *Operator* or *Agent*, which is existent in the *egge*, and in every *seed*, is so inspired with power from the *Parents*, that it fashions the *chicken* to the likeness of the *Parents*, not of it self; and that a mixt likeness too, as proceeding from them both united in *coition*: and since all things are transacted with an admirable providence and wisdom, the presence of the *divine Deity* is clearly implied.

But of this we shall more largely treat elsewhere, when we shall endeavour to shew, what remains in the *Female* presently after *coition*, and where it abideth: and likewise (because nothing at all is discoverable in the *cavity* of the *womb* after *coition*) what that *prolific contagion*, or first *conception* is? Whether it be any *corporeal* thing, any where reserved in the *female*, or something *incorporeal*? And whether the conception of the *womb* be like the *conception* of the *Brain*, and so *Fecundity* be attained, as *Science* is? (for there are arguments not wanting to prove it) and as *Motion*, and *Animal operations*, do take their rise from the *conception* of the *Brain* (which we call the *desire*, or *appetite*) so whether do *Natural motions* likewise, and the *Operations* of the *Vegetative faculty* (especially *Generation*) depend upon the *conception* of the *womb*? Again, how that *prolific contagion* is of a mixt nature, and transferred from the *Male* into the *Female*, and from *her* into the *Egge*? And lastly, how the *contagion*, or infection of all preternatural

272 *Of the Order of Generation, and first, Ex. LI.*
natural diseases, and distempers do spread, and propagate insensibly.

*Of the Order of Generation, and first,
of the first Genital Particle.*

EXER. LI.

WHat that is which is produced in the *Female* immediately upon *coition*, or doth remain in her, which we hitherto do comprise under the name of *contagion*, by which, as by Infection, the *female* is rendered fruitfull by the *male*, and afterwards doth generate a *fetus* of her own accord, shall be said in its place, where we shall make a stricter disquisition and examination of that matter. In the mean time, we shall signifie to you, all such things as do openly display themselves in the order of the *production* of the *parts*, and are worth the *Observation*.

And first of all, because it is plain that the *chicken* is built by *Epigenesis*, or the additament of parts budding one out of another, we will discover what *part* is first founded before all its company, and what is observable concerning it, and the manner of its *generation*.

*de gen. an.
l. 2. c. 1.*

That which *Aristotle* affirms concerning the *generation* of perfect *animals*, is an undoubted truth, and most apparent in an *egge*; namely, that all the *parts* are not framed together, but one after another in order; & that the first in being is that *geni-*

tal partic'le ; by virtue of which afterwards (as from their *original*) all the rest of the *parts* do arise. As we see in the *seeds of Plants* (as *Beans* and *Acorns*) a budding, or protuberant *point*, which is the foundation of the future *Tree*.

And this partic'le is like a Son set free, and dwelling Ibid. c. 1. in a mannour of his own, and a principle subsisting of himself; whence afterwards the order of the parts is delineated, and all things ordered and regulated which conduce to the complement of the Animal. For since, no part is its own parent, but when it is once begotten, doth provide for it self: therefore that part must of necessity be first made, which doth contain the principle of encrease (for be they Plants or Animals, they have all that in them which contains a power of vegetation and sustaining;) and distinguisheth also and form- *Ib. c. 4.*
eth all the other parts in their due order and rank: therefore the Soul is primarily in that primogenit partic'le; which Soul is the fountain and author of Sense, Motion, and Life of the whole. That therefore is the principal partic'le, from which the vital spirit, and native heat do descend into all the rest; in which the Physitians calidum Innatum sive implantatum, innate or implanted warm substance, doth first display it self; and the domestick household-God or lasting fire inhabits; from whence Life floweth into the Body in general, and each particular part; from whence Nutrition, Ayde, Growth, and Comfort derive their streames: Lastly, where Life first ariseth to the born, and setteth to the dying creature.

These indeed are all true of the first genital part, and do evidently appear in the generation of the chicken; and therefore, as I conceive, being moved thereunto by sundry Observations, the opinion of some Physitians, whose Philosophy is ill founded,

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is to be rejected (whereby they decree that the three principal and eldest parts, the Brain, the Heart, and the Liver, do together spring out of the small bladders or bubbles) so neither can I assent to Aristotle himself, who concludes that the Heart is this first genital and animate particle. For the truth is, I am perswaded that this Prerogative is only due to the Blood: for the blood is it which is first seen in Generation. And that not onely in an Egg, but in every Fetus, and animal conception whatsoever: As shall plainly appear anon.

There appears, I say, from the beginning, *Punctum Rubrum saliens*, *Vesicula pulsans*, *Fibræque inde deductæ*, the Red capering Point, the Panting Vesicle, and the Fibers deduced thence, which contain blood. And so farre as I could possibly discern by accurate Inspection, the Blood is formed before the *Punctum saliens*, and is endowed with vital heat, before it moves by pulse; and in it, and from it doth the pulsation begin. For I have found it true by sundry experiments both in an egg, and elsewhere, that the blood is it, in which (so long as the vital heat is not quite extinct) resideth the possibility of reviving.

And since the *Vesicula pulsans*, and the *Fibres* containing blood which are derived from it, are seen before any other parts; I conceive it consonant to reason, that the blood is made before his receptacles; that is to say, the thing contained, before the thing containing; for the latter is made to be serviceable to the former. And therefore it is most probable, That the *Veines*, and *Fibres*, and then the *Vesicle*, and after it the *Heart*, as being Instruments destined to receive and house the blood, are erected for the transmission, and distribution of it, and that the blood is the primary particle of the body.

And

And this is manifest by many Observations; but chiefly, in that some *living creatures* (and such too as have *blood*) live a good while without any pulse at all; and some become like *Anchorites* all the *Winter* long, and yet survive, though their *Hearts* within them do respire all their *motions*, and their *Lungs* make *Holy-day*, and forbear *respiration*; like those persons, who in a *Syncope*, *Lipothymia*, or *Hysterical passions*, lie half-dead without the motion of the Pulse.

Being therefore ascertained out of those things which I have observed in an *Egge*, and the *dissection* of *Animals* while they were alive, I conclude (against *Aristotle*) that the *blood* is the first *Genital particle*, and that the *Heart* is its Instrument designed for its *Circulation*. For the *Hearts* business or function is the propulsation or driving forth of the *blood*, as appears in all *Animals* that have *blood*: and the office of the *Vesicula pulsans* is the very same, (in the generation of the *Chicken*) which I have shewed to many persons, in the first conceptions of *Animals*, (as well as in an *Egge*) when it hath been less than a *Spark*, panting, and in its motion, drawing it self together, and so squeezing out the *blood* contained in it, and by relaxing it self again, receiving and entertaining *blood* afresh.

And hence the prerogative and antiquity of the *blood* appears, seeing that the *Pulse* proceedeth from it. For there being two parts of *Pulsation*; (*Distention*, and *Contraction*, or *Systole* and *Diastole*) and the first of these motions is *Distention*, it is manifest that that action proceeds from the *blood*; but the *Contraction* is made by the *Vesicula pulsans* in an *Egge*, (as by the *Heart* in a *Chicken*) by its proper fibres; as by an *Organ* destined to that use.

And it is also certain, that the said *Vesicula*, as also the *Auricula cordis*, the *deaf-eare* of the *Heart*, afterwards (from whom the *Pulsation* first begins) are incited to the *constrictive motion*, by the *blood* distending them. The *Diastole*, or *Dilatation*, is made by the *blood* boyling or swelling by the *spirits* within it : And so *Aristotles* Opinion concerning the *pulsation* of the *Heart*, (namely, that it is made by a kinde of *Ebullition*) is in some sort true. For as in *Milk* set upon the *fire*, and in *Beere*, we see dayly a *Fermentation*, working, or *Intumescence* ; so is it in the *pulse* of the *Heart*, in which the *blood*, as by a kinde of *fermentation* working up, is *distended*, and then ebbs, or falls down againe : and that which befalls them *per accidens*, from an *external agent* (namely, an *adventitious heat*) that is accomplished in the *blood*, by its own *internal heat*, or *innate spirit* ; and is also regulated by the *soul* in a natural way, and for the preservation of *living creatures*.

The *Pulse* therefore is performed by a twofold *Agent* ; namely, the *Distention* or *Dilatation* proceeds from the *Blood* ; and the *Constriction*, from the *membrane* of the *vesicula* in the *Egge* ; (but in the *Fetus* when it is born, from the *Deaf-eares*, and *Ventricles* of the *Heart*) and by the mutual performance of this alternate and interchanging *motion*, the *blood* is driven round the whole *body*, and so our lives continued.

Nor is the *Blood* therefore onely to be called the *Primigenial* and *principal part*, because that in, and from it the fountain of *motion* and *pulsation* is derived ; but also, because the *Animal heat*, or *vital spirit* is first radicated and implanted, and the *soul* takes up her first mansion in it. For wheresoever the immediate and *principal Instrument* of the
vegetative

vegetative faculty is first found, there in probability the *soul* first resides, and takes her Beginning; as being inseparable from the *spirit*, and the *calidum innatum*.

For however in *Artificial Operations* (as *Fabricius* rightly admonisheth) the *Artificer* and the *Instruments* are separated; yet in the works of Nature they are conjoyned, and one and the same: so the *Stomack* is both the *Author*, and the *Instrument* of *chylification*. So in like manner, the *Soul* with the *Spirit* (her *Instrument*) is immediately conjoyned: and therefore be it in what part it will, that *heat* and *motion* first begin, there also the *Life* doth first arise, and last expire; and out of question, the most intimate domestick *Deities*, and *Soul* it selfe, are there enshrined. pag. 28.

Life therefore consists in the *blood*, (as we read *Levit. 17.* in *Holy Scripture*) because in it the *Life* and *Soule* 11. & 14. do first dawn, and last set. For I have experimented in the *dissection* of many *live Animals*, that when the *body* was now a dying, and breathing done, the *Heart* continued its pulse a while, and kept up *life* in it. And when the *Heart* hath now given over, you shall discern a *motion* yet surviving in the *Auriculae*, or *Deaf-ears*; and though the other faile, yet the *Right* will still be stirring; and when that submits to *Fate* too, yet you shall perceive a kinde of *undulation*, or waving to and fro, and obscure *trepidation*, or *palpitation* in the *champion-blood*, proclaiming that he gave the last blow. And any man may plainly see, that the *blood* retains heat, (that deriver of *Life* and *Palsation*) when all the other parts are chilled, and cold: which heat when it is quite extinct, as the *blood* is then no longer *sanguis*, sed *cruor*, *Blood*, but *Gore*; so now no longer hope of returning back to *life*.

But, both in an Egge, and in gasping *Animals*, after all *pulsation* is expunged, if you apply a gentle warmth either to the *Punctum saliens*, or the right *Auricle* of the *Heart*, you shall presently see the *motion*, *pulsation*, and *life* set on foot again by the *Blood*; except he have quite fore-gone all his *innate heat*, and *vital spirit*.

By all which it is most evident, that the blood is the *Genital Part*, the fountain of *Life*, *Primum vivens*, & *ultimum moriens*, the First-born, and the Longest Liver, and the chief Palace and Court of the *soul*: in which (as in its Spring-head) the heat doth first and chiefly flow, and flourish: and from which all the other parts of the *Body* derive their life and influent warmth. For that heat streaming with the blood, doth sprinkle, cherish, and preserve the whole: as we have heretofore demonstrated in our Booke, *de Motu sanguinis*.

And therefore *Blood* is found in every particle of the *Body*, nor can you find footing for the point of a needle, or the edge of your naile, where you shall not immediately start the blood: as if, were it not for the *blood*, the body would enjoy no heat, nor life. Therefore the *blood* being never so little concentrated and fixt, (*Hippocrates* calls it, ἀπληψιν τῶν φλεβῶν) as it is in *Swoning*, *frights*, *extream cold weather*, and the approach of the *Paroxysme* or *fit* of an *Ague*, you shall presently behold, the whole *body* freeze, and grow stiff, and languish in a pale and livid complexion: but the *blood* being summoned back, by applied *Fomentations*, *exercise*, or *affections* of the *Mind*, (as *Joy*, or *Anger*) how nimbly do all parts recover their *Heat*, *Floridnesse*, *Vigour* and *Beauty*.

And hereupon the ruddy sanguine parts alone,
are

are called the Hot parts, as the *Flesh*; but the *white* and *bloodless parts*, as the *Nerves* and *Ligaments*, the Cold. And as Sanguineous Animals exceed the bloodless; so even in the parts, those that are more liberally indowed with Blood, are counted the Eminent parts. And the Liver, Spleen, Reins, Lungs, and Heart it self (if you strain all the blood out of them, for whose sake they are chiefly called *Viscera*) they presently grow pale, and wan, and are to be registered amongst the colder parts.

The Heart himselfe, I say, doth by the *Coronary Arteries* receive the Blood, its influent *beat* and *life*, both which it enjoyes upon no other account, then the meer bounty of the *Blood*. Nor can the *Liver* proceed in its *publick office*, without the influence of *blood* and *beat* from the *Celiacal Artery*. For there is no where any affluence of *beat*, without an Influence or influx of *blood* by the *Arteries*. And therefore in the first Confirmation of all the parts, before they put themselves into publick undertakings, they are to be discovered *pale*, and *blood-lesse*: hereupon the old *Physitians* and *Anatomists* supposed them to be *spermatical parts*, and this speech was wont to obtain amongst them, that in Generation, *Aliquot in Lacte dies absumuntur*, some daies are spent in the *Milk*, that is about the Constitution of the *white; Spermatical parts*. The very substance of the *Liver* it self, the *Lungs*, and the *Heart*, at their first appearance are exceeding *white*. Nay the *Cone* of the *Heart*, and the *walls* or *sides* of its *Ventricles*, are even then *white*, when the *Auricle* are full, and dyed with *Scarlet-blood*, and the *Coronary Vein* looks ruddy. So likewise the *Parenchyma* of the *Liver* is it selfe *white*, when the branches and propagations of its

Veins are blushing with *blood*: nor doth it execute its *publick office*, untill it be thoroughly drenched with *blood*.

And lastly, the *blood* doth so surround, and peirce into the whole *body*, and impart *heat* and *life* to all its *parts*, that the *soul* may justly be counted resident in it, and for his sake, *Tota in tota & tota in qualibet parte*, to be all in *all*, and all in every *part*, (as the old saying is.)

But it is so far from truth (which yet *Aristotle* and all *Physitians* affirm) that the *Liver*, or *Heart* is the *Author* of the *Blood*: that the contrary, out of the *fabrick* of the *chicken* in the *egge*, is most manifest: namely, the *Blood* rather is the *Author* of the *Heart*, and *Liver*. And this also *Physitians* before they are aware seem to acknowledge, while they conclude that the *Parenchyma* of the *Liver* is a certain affusion, or conflux of *Blood*: as if it were nothing else but *blood* congealed. Now it must have a being before it can be affused, or coagulated: and that it is so, *experience* her self openly displays; for *blood* appears in the *egg*, before there be any *track* or *Rudiment* of any such thing as the *Body*, or any of the *Viscera*. And yet no *blood* can come thither from the *Mother* to the *Fetus*, (as people commonly phantasie in *Viviparous productions*.)

The *Liver* of *Fishes* is alwaies *whitish*, though their *Veins* are purpled, and dark. And our *Hens* the better they are crammed, so much the more do their *Livers* impair, and grow pallid. *Green-sicknes* *Virgins* that are *Cachectical*, as the *habit* of their *bodies* is pale, so is their *Liver*: an evident signe of the penury and dearth of *Blood*. Therefore the *Liver* borrows his *heat* and *complexion* from the *blood*, and not the *blood* from him.

Hence

Hence it is plaine, that *blood* is the *prime genital Part*, whence the *soul* primarily results, and out of which the *primary animate part* of the *Fætus*, which is the fountain of all the rest, both *similar*, and *dissimilar* is derived, which by that means attain their *Vital heat*, and become subservient to it: And the *Heart* is erected for this end and purpose onely, that it may by continual *pulsation* (to which the *Veins* and *Arteries* are ministerial and subservient) entertain this *blood*, and spout it out again up and down through the whole *body*.

All which is the clearer discovered by this, that the *Heart* hath not a *pulsation* in all *Animals*, nor yet at all times; when yet the *blood*, or something proportionable to *blood* is never wanting in any.

Of the Blood, as it is the Principal Part.

EXER. LII.

IT is therefore evident, even to the *Eye*, that the *blood* is the *Primigenial*, and so the *Genital part*: & that all those attributes recited in the precedent Chapter are consistent with it: namely, that it is the builder and preserver of the *body* and *principal part* wherein the *soul* hath her *Session*. For (as we newly said) before any particle of the *body* appear, the *blood* is born, and groweth, having a *pulsation* (as *Aristotle* saith) within the *Veins* moving

De hist. an.
l. 3. c. 19.

ving to and fro with a Pulse, and is above all the humours diffused through the whole body. And so long as life doth last, the Blood alone is *Animate*, and hot.

Moreover, by his various motions, in celerity, or slowness; vehemence, or feebleness, &c. He plainly discovers his resentment of the affronts which any thing casts upon him, and the friendships of such as cherish him. We therefore conclude, the blood lives and is nourished of it selfe, no way depending upon any other part of the body, as elder or worthier then it self. But whether the whole body depend upon it, as being postgenit, adjoined, and a kind of appendix or retainer to it, is not the business of this place. I shall only add, what Aristotle confesses, Truly the nature of the blood is the cause, why very many things befall Animals, both in order to their manners and sense. So that hence we may perceive the Causes not of life onely in general, (for you can never discover any other *Calidum innatum aut influens*, innate or influent heat which may be the immediate instrument of the soul, besides the Blood) but also of longer or shorter life, or sleep, and wakefulness, of Wit and Strength &c. For by its tenuity (saith Aristotle in the same place) and cleanness or purity, creatures are wiser, and have quicker senses: and likewise are either more timorous, or courageous, angry and furious: according as their blood is more dilute and thin, or more compact and grosse by fibres.

De part.
an. l. 2. c. 4.

Hist. an. l.
3. c. 9.

Nor is blood the Author of life onely, but according to its severall discriminations, it is the cause of health, or diseases. And Poysons themselves, which assault us from without, (as poisoned darts or bullets) did they not infect the blood, would do us no prejudice. So that our life, and wellfare is derived unto us from the same spring. If the blood

blood be over liquid, saith Aristotle, men grow sick; for it degenerates into so serous a gore, that some have sweet Blood. If too much of it stream out, they die. For by want of blood, all the parts do not onely languish presently, but the Animal it self soon expires. I conceive it inconvenient to set down Experiments to confirm this, because they require a peculiar Tract. I perceive that the wonderful Circulation of the blood, first found out by me, is consented to almost by all: and that no man hath hitherto made any objection to it, greatly worth a confutation: Wherefore if I shall subjoine the causes, and benefits of that Circulation, and lay open some other secrets of the blood, as, how much it conduceth to the happiness of the creature, as also to both soul, and body, that so men may be cautious to preserve their blood pure and clean, by commodious diet, I conceive I shall perform an office, not more new, then useful, and acceptable to Philosophers, and Physicians: nor will this opinion seem so improbable and absurd to any, as once to Aristotle; namely, That the Blood, like a Tutelar Deity, is the very soul in the body, as Critias of old, l. 1. c. 2: and others thought, supposing sense to be the chiefest property of the soul, and that sense to be in her by the nature of the Blood. Now some concluded it to be the soul, because it hath a power of moving by its owne nature: As Thales, Diogenes, Heraclitus, Alcmaeon, and others.

But that both sense and motion are in the Blood, De hist. an. is conspicuous by many tokens, though Aristotle l. 1. c. 19. denied it. For if he himself compelled by the truth & de part. of the thing it self, did confess, that there was a soul in an egge, though the egge were addle: and an. l. 2. c. 3. that in the Geniture and Blood was found a divine substance, proportionably answering to the Matter of the

the Stars, and that it was the *Creators Vice-Roy*. If some of the *Moderns* say, that the seed of *Animals* ejected in *Coition* is *animate*, Why should we not upon as good reason say, that there is a soul in the *Blood*? and seeing it is the first begotten, first moved, & first nourished, why should we doubt to affirm, that the *soul* is first raised, & kindled out of it? *Blood* is that, wherein the *Vegetal* and *sensitive operations* first shine forth: in which the primary and immediate officer of the soul, is bred; which is the common tie of *soul* and *body*; and in which, as in her *Chariot*, the *soul* visits and scattereth influence upon all the parts of the body.

Besides, since the contemplation of *Geniture* is (as we have seen already) so difficult, (namely, how the *fabrick* of the *body* should be built by it, with providence, art, and divine understanding) why should we not by the same right, admire the excellent nature of *blood*, and harbour as worthy thoughts concerning it, as *seed*? especially seeing the *Geniture* it self (as appears by the *egge*) is made of the *blood*; and all the whole *body* (as from its *Genital part*) seems not onely to desume its first Foundation, but Preservation also, from it.

Thus much by the way concerning this matter, being to treat more fully and exactly of it elsewhere. Nor do I conceive it worth the trouble, to dispute here, whether the definition of a *part* in its proper acceptation agree to *blood*? which some deny upon these grounds chiefly, because it hath not *sense*, and because it flowes and insinuates into all the *parts* of the *body*, to cater convenient dyet for them. But I have found many things about the manner of Generation, by which being convinced, I shall establish the contrary to those things, (which *Philosophers* & *Physitians* commonly

ly affirm, or deny.) At present I will onely say, that in case we should consent that the *blood* hath not *sense*, yet it cannot be thence inferred, that it is no part of the *sensitive body*, and that the chiefest too. For neither the *Braine*, nor the *Spinal Marrow*, or the *Crystalline*, or *Glassie humour* of the *Eye* have any *sense*, and yet all *Philosophers* and *Physitians* do to this day with one consent, allow them to be *parts* of the *body*. But *Aristotle* did number it amongst the *similar parts*, and *Hippocrates* also; for while he constitutes the *Animal body*, out of *containing*, and *contained parts*, and *impetum facientibus*, *spirits*, he did necessarily own the *blood* amongst the *contained parts*.

But of this more at large, when we enquire what a *part* is, and how many several acceptations there are of it. In the mean time, we will not conceale this *Admirable Experiment* (by which it shall appear that the most principal member of all, namely, the very *Heart* it self, may seem to be insensible.)

A Noble young Gentleman, Son and Heire to the honorable the *Vice-Count* of *Mountgomery* in *Ireland*, when he was a *childe*, had a strange mishapp by an unexpected *fall*, causing a *Fracture* in the *Ribs* on the *left side*: the *Bruise* was brought to a *Suppuration*, whereby a great quantity of putrified matter was voided out, and this putrefaction gushed out for a long while together out of the wide wound. I deliver it from his own mouth, and the testimony of other *creditable persons*, who were *eye-witnesses*. This person of Honour, about the *eighteenth*, or *nineteenth year* of his *Age*, having been a *Traveller* in *Italy* and *France*, arrived at last at *London*: having all this time a very wide gap open in his *Breast*, so that you might see and touch his

his *Lungs* (as it was believed.) Which, when it came to the late King *Charles* his ear, being related as a *miracle*, He presently sent me to the Young Gentleman, to inform *Him*, how the matter stood. Well, what happened? When I came neer him, and saw him a sprightly Youth, with a good complexion, and *habit of body*, I supposed, some body or other had framed an untruth. But having saluted him, as the manner is, and declared unto him the Cause of my *Visit*, by the *Kings Command*, he discovered all to me, and opened the void part of his *left side*, taking off that small *plate*, which he wore to defend it against any blow or outward injury. Where I presently beheld a vast *hole* in his *breast*, into which I could easily put my three Fore-fingers, and my Thumb; and at the first entrance I perceived a certain *fleshy part* sticking out, which was driven in and out by a reciprocal motion, whereupon I gently handled it in my hand. Being now amazed at the novelty of the thing, I search it again and again, and having diligently enough enquired into all, it was evident, that that old and vast *Ulcer* (for want of the help of a skillfull *Physitian*) was miraculously healed, and skinned over with a membrane on the *Inside*, and guarded with *flesh* all about the brimmes or margin of it. But that *fleshy substance* (which at the first sight I conceived to be *proud flesh*, and every body else took to be a *lobe* of the *Lungs*) by its *pulse*, and the differences or *rythme* thereof, or the time which it kept, (and laying one hand upon his *wrest*, and the other upon his *heart*) and also by comparing and considering his *Respirations*, I concluded it to be no part of the *Lungs*, but the *Cone* or *Substance* of the *Heart*; which an excrecent fungous *Substance* (as is usual in foul *Ulcers*) had

had sented outwardly like a Sconce. The Young Gentlemans Man did by dayly warm injections deliver that fleshy accretion from the filth & pollutions which grew about it, and so clapt on the Plate: which was no sooner done, but his Master was well, and ready for any journey or exercise, living a pleasant, and secure life.

Therefore, instead of an Account of the Business, I brought the Young Gentleman himself to our late King, that he might see, and handle this strange and singular Accident with his own Senses; namely, the Heart and its Ventriles in their own pulsation, in a young, and sprightly Gentleman, without offense to him: Whereupon the King himself consented with me, That the Heart is deprived of the Sense of Feeling. For the Party perceived not that we touched him at all, but meerly by seeing us, or by the sensation of the outward skin. We likewise took notice of the motion of his Heart; namely, that in the Diastole it was drawn in and retracted, and in the Systole came forth, and was thrust out; and that the Systole was made in the heart, when the Diastole was sensible in the wrist; and also that the proper motion of the heart is the Systole; and lastly, that the heart then beats upon the breast, and is a little prominent, when it is lifted upwards and contracted into it self.

Nor is that other Controversie (namely, whether the Blood do onely serve to nourish the Body) to be much insisted upon in this place. Aristotle indeed doth in several places contend, that the blood is *Alimentum ultimum*, the last Aliment, and with him the whole School of Physitians give suffrage. And yet many things hard to be unfolded, and of bad coherence, will ensue upon that opinion. For, when Physitians treat of the Blood in
the

the *Physiological part of Physick*, and declare the onely use and end of it to be, to administer nutriment to the *Body*: they compound it of the four *juices*, and *humours* of the *body*; grounding that composition upon the combinations of the *four first qualities*: and thereupon they affirm, the mass of the *blood* to be compounded of both the *Choler*, (namely, the *yellow*, and *black*;) the *Phlegmatical humour*, and the *Blood*. And for that cause, they recite the four sorts of *humours*, whereof the moist and cold one is called *Pituita*, the *Phlegmatical humour*; the cold and dry, *Melancholia*, *Melancholy*; the hot and dry, *Bilis*, *Choler* simply, or *yellow Choler*; and lastly, the hot and moist, *Sanguis*, *Blood*. Moreover, of each of these three first kindes, they say, Some are *Nutritii*, *Nutritive* (of which the whole *Body* consists;) others, *Excrementii*, *Excrementitious*. And out of the *Nutritive humours* (as out of *heterogeneous parts*) they conceive the *Blood* is compounded: and yet so, that the *Phlegmatical humour* is so crude, as that the *Native heat* (though stronger then it) cannot convert it into laudable *blood*: and so, they likewise deny that *Choler* can convert into *blood*, though they affirm, that *Blood* is easily turned into *Choler*, and *Choler* into *Melancholy* (by the excess of the *Concocting heat*.)

Which if it be true, and there be no *Regress* allowed; namely, from *Melancholy* into *Choler*, and from *Choler* into *Blood*: they ought then to say, that all those recited *Humours* are in order to *Melancholy*, and that *Melancholy* is the chief, and most concocted nutriment. Nay, they must of necessity grant a two-fold *blood*; namely, that whole mass of *blood* contained in the *veines*, compounded of those four *humours*; and also that purer, more florid,

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rid, and spiritual part of it, which they call *blood* in a stricter acceptation: which some contend ro run in the *Arteries*, and therefore being channelled apart from the other *blood*, they depute it to other uses. Whereupon it follows upon their persuasion, that the *pure blood* is not the *aliment*, but only the *commixt juices*, or rather *Melancholy*, to which the other humours tend at last. Aristotle De part. also, as he thought the *blood* was instituted for nutriment sake, so he likewise thought it compounded as it were of parts; namely, of a something thick substance, and blacker, which upon concretion doth subside in the bottom of the *Sawcer*, and that he counted to be the baser part. For the blood, saith he, if it be sound, is red, and tasteth sweet; but if it be vitiated either by nature, or disease, it groweth blacker. He would also have it consist of a fibrous part, or of fibers: which fibers being taken away, saith he, the blood will neither congeal nor thicken: Also in the Blood he did own a sanies, or watry blood. Sanies, saith he, *sanguis inconcoctus est*, the watry blood is unconcocted blood, either because it is not as yet thoroughly concocted, or that it is dilute and washy after the manner of the Serum. And this he counts the colder part of the Blood; but the Fibers, the earthy part of the Blood. Ibid.

Wherefore, according to his opinion, the blood of Animals is divers; in some, more serous and thin, and as it were a sanies, or Ichor, a kinde of Gore, or washy Blood, as in Insects, and colder and imperfecter Animals: in some, grosser, and more fibrous, as in the Bore, the Oxe, and Ass, &c. and in some (whose temperament is vitiated) the blood is blacker: but in others again, clean, sincere, and florid; as in Birds, and chiefly in Men.

By which we see, that both Physicians, and Aristotle,

sticle, did constitute the *blood* out of parts and differences in some manner alike. *Physitians* indeed do onely take notice of humane blood, and of that as it spins into a Sawcer in *Phlebotomy*, and so coagulates. *Aristotle* contemplates the *blood* of all creatures in general, or that which beareth an Analogy with *blood*. But laying aside all cavil, and omitting the inconveniences which do pursue their opinion, I shall briefly touch upon those things, which they both consent in, and are plainly discovered by sense it self, and are more pertinent to our business: intending elsewhere to examine them at large.

Though (as I have informed you) the *blood* is called a part of the *body*, and that the *primigenial* and *principal* part; yet if it be considered in the whole lump (as it is in the *Veins*) nothing hinders, why we may not say, that it contains *Aliment*, concocts it, and doth apply it to all parts: and that being one and the same thing, yet in that acceptation it may be said, both to feed, and to be fed, as also to be both the *material* and *efficient* cause of the *Body*: and naturally to have that very constitution, which *Aristotle* conceived to be necessary in the *primigenial* part; namely, that the *blood* is partly of a *similar*, and partly of a *dissimilar* constitution. For, saith he, *Since for senses sake it is necessarily ordered, that there should be similar members in Animals; and since both the power of sensation, motion, and nutrition, are all comprehended in the same member, (namely the Primogenit) it is necessary that that member (which contains such principles in it) should both be simple, that it may be capable of all sensible objects; and also dissimilar, that it may move, and act.* Wherefore, he goes on, in the race of creatures that have blood, the *Heart* is com-

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ted such a member : but in the bloodless, that member which is proportionable to the Heart.

Now if by the Heart he understand that particle which is first seen in the Egge ; namely, the Blood, together with its receptacles (the *Vesiculae pulsantes*, and the Veins) as one and the same Organ ; I then conceive he speaks most true : for the Blood as it is discovered in the Egge and the *Vesicula*, is partly similar, and partly dissimilar. But if he understand it otherwise, that which is seen in the egge, will easily confute him : for the substance of the Heart, being considered without the Blood (namely, its *Cones*, and the *Walls* or partitions of its *Ventricles*) is generated long after : and continues so long white, without any irrigation of blood upon it, untill the Heart be fashioned into an Organical form, such as may spout the blood through the whole body. Nor doth the Heart, then, appear of a similar or simple constitution (as is fit for a *Primogenit* part to do) but *fibrous*, *fleshey*, and *musculous* : and indeed (as *Hippocrates* would have it) a plain *Muscle*, or Instrument of motion. But, the blood, (as it is first seen, and as it beats being yet comprehended in the *Vesicula*,) is plainly of that constitution, which *Aristotle* judgeth necessary to a *Principal* part. For the blood, while it is in its natural constitution in the body, is altogether similar. But so soon as it is dislodged, and out of its receptacles, and puts of its native heat ; it presently degenerates into several parts, as some dissimilar thing.

But if the blood were naturally designed onely to the nourishing of the body, it would be onely of a similar constitution ; like the *Chyle*, or *White* of an egge ; or at least it would be a mixt body, being compounded of the foresaid parts or juyces,

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and yet truly one : as those other *juyces* ; namely, the *Choler* and *Phlegme*, which after death, even when they are taken out of their habitations, remain the same, as when they were seen in the live body : but are not so soon changed.

Wherefore, what *Aristotle* attributes to a Principal part, that very same thing is proper to *blood*. For *blood*, as it is a Natural body, being an Heterogeneous, or Dissimilar substance, is compounded of those *parts*, or *juyces*. But as it lives, and it the chief Animal part, compounded of a body and soul. But when that soul, by reason of the expiration of the native heat, doth vanish, and its native substance is presently corrupted, and is dissolved into those parts, of which it was formerly made : namely, first into a Watry Blood, next into Red, and White parts : and the Red parts, which are uppermost, are most florid : but those that sinck downwards grow dark, and black. Now some of the parts also are *fibrous*, and thicker, as being the rye, and connexion of the rest ; others are *ichorows* and *serous*, upon which the coagulated lump useth to float. And into this *Serum* almost all the *blood* degenerates. Now these parts are not in the live *blood*, but onely when it is now corrupted and dissolved by death.

Besides the recited *parts*, there is seen in hotter and stronger Animals, as in Horses, Oxen, and Men also of a more lively constitution, another part of *blood*, which when the *blood* is let out and grumeth, seating it selfe in the upper part of the redder *blood*, doth condense, and plainly resemble a Gelly made of *Harts-horn*, or kind of *Mucilage*, or thicker white of an egge. The vulgar count it the *Phlegme*, and *Aristotle* the crude and unconcocted part of the *blood*.

I have

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I have observed this part, to differ, as well, from the *serous*, (upon which the coagulated gore useth to swim) as from the other *parts*, as likewise from the Urine, which is dreined by the Kidnies from the *blood*. Nor is it to be thought the cruder and colder part of the *blood*, but the more *spirital*, as I suppose, and that by two *experiments*; First, because it swimmes above the *florid* and brighter part of the *blood*, (which is vulgarly conceived to be the *Arterial blood*) as being *hotter*, and fuller of *spirits* then it, and upon the disgregation of the *blood*, obtaines the upper place.

Also in *breathing a Veine*, this sort of *blood* (whereof there is plenty in persons of a *hot temperature*, that are strong and fleshy) it darts it self out in a longer stream, and more vehemency (as if it spirited out of a Syringe) & hereupon we count it *hotter*, and more *spirital*: as that *geniture* is counted most fertile & fraught with *spirits*, which leaps farthest and most forcibly.

And that this *gelly* doth much differ from that *ichorous* and *watry substance*, which (as being colder then the rest) sinketh down to the bottom of the *sawcer*, is evident for two reasons: for the *watry* and *washy* part is more crude and inconcocted, then that it may be wrought up into perfect *blood*. But the *gelly*, which is thicker and more *fibrous*, swimming above the *lump* of *blood*, appeareth more concocted and elaborate then it. And therefore in the solution or partition of the *blood*, this *gelly* keeps aloof, the *whey* or *sanies* lowest, but the *lump* and *red parts* (as well the brighter as the darker) possess the *middle region*.

Now is it most certain, that not onely that part, but all the *blood*, nay the very *flesh* it self (as

may be observed in *Bodies hanged in Chains*) may may be corrupted into *ichorous whey*. As being resolved into that substance, of which they were first compounded: so *Salt* is resolved into *Lie*, from whence it first sprung. So likewise in every *Cachexie*, the *blood* that is let, abounds with plenty of *Serum*: so that sometimes there scarce appears any *grumous part* at all, but all the *blood* seems to be one entire *washy gore*; as we finde in that kinde of *Dropsie* called *Anasarca*: and it is also natural in creatures that are *bloodless*.

Likewise, if you breath a *veine* immediately after you have eat and drank, (before the second concoction be finished, and the *Serum* descended through the *Kidnies*) or upon the first approach of a fit of an *Ague*, you shall finde the *blood* to be *washy*, inconcocted, and mingled with much *whey*. But on the contrary, if upon an empty *Stomack*, or discharge of the *Urine*, or a large *Sweat*, you open a *Veine*, you shall finde the *blood* thick (as being quite destitute of *Serum*) and being almost all condensed into a *lump*.

And as when the *blood* growes raw and crude, you shall perceive but very litle of this *gelly* floating a top. So if you poure out the *Serum* separated from the *lump* or *mass*, and let it simmer upon a gentle *fire*, you shall soon see it changed into this *gelly*: which is a manifest signe, that that *washy* or *serous substance*, which is now divided from the rest of the *blood*, is perhaps some matter of the *Urine*, but not the *Urine* it self, though in colour and consistence it look like it. For the *Urine* being boyled, is not thickned into a *fibrous Gelly*, but rather into a *Lie*: but this *washy* or *serous part* being a while gently *beated*, condenseth into a *gelly* like that above: as on the contrary,

that

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that ~~may~~ go, or gelly, degenerating into more crudity by corruption, is dissolved into Serum.

And thus farre have I brought this part of the blood (which is my own Observation) upon the Stage; of which (and the other parts of blood, which are apparent to sense, and allowed by the authority of Aristotle, and Physitians) I shall more copiously discourse hereafter.

In this place, not to digress farther, I conceive the blood to be taken (with Aristotle) not as it is simply understood, and called Cruor, but as it is a living part of an Animal body. For so Aristotle: *De gen. an. l. 2. c. 3.* The blood is hot in such a sense, as if we could call hot water by one only word, and not as a subject receiving heat into it. For heat is in the essence of the blood; as whiteness, in a white man. But when blood is made hot by any distemper, or passion of the Minde, it is not then calidus per se, hot, by its own heat. And thus we may say of that which is moist, or dry. Wherefore, partly a hot, and partly a moist substance is in the nature of such kinde of things; but if you divide them, they then grow cold, and congeale; and such is blood.

Blood therefore as it is a living part of the Body, is of a doubtfull nature, and falls under a two-fold consideration. And therefore materialiter & per se, it is called nutriment; but formaliter, as it is endued with heat, and spirits, (which are the immediate instruments of the Soul) and with the Soul it self: it is to be counted the Bodies Genius, and Conserver, the Principal, Primigenit, and Genital part. And as a Prolifical egg is the Matter, Instrument, and Efficient cause of the Chicken, and as all Physitians count the geniture of both Sexes mingled in the womb after coition, both for the material and efficient of the Fetus; so, upon a better right, may we affirm, That the Blood is both the Matter and

Preserver of the Body, and not the bare *Aliment*. For it is a known thing in *Creatures* that are starved by hunger, and Men also that dye of *Consumptions*, that a great quantity of *blood* remains in their *Veins* even after death. And also *Young men* that are in their growth, and *Old men* that are declining, have a proportionable quantity of *blood*; namely, according to the increase, or diminution of their *Flesh*. So that the *blood* is a *part*, and not the *nutriment* onely of the Body. For if that were the onely use of it, no man would be starved, so long as any drop of the *blood* remains in the *veins*, as the flame of a *Lamp* doth not expire, so long as any *oyle* at all remains to support it.

But while I affirm the *soul* to reside first, and principally in the *blood*, I would not have any man hastily to conclude from hence, that all *Blood-letting* is dangerous, or hurtfull; or believe with the *Vulgar*, that as much of *blood*, so much of *life* is taken away, because *Holy-writ* placeth the *life* in the *blood*. For dayly experience shewes, that *Letting blood* is a safe cure for several *Diseases*, and the chiefest of *Universal Remedies*: because the default, or superfluity of the *blood* is the seminary of most *distempers*; and a seasonable evacuation of it, doth often rescue men from most desperate maladies, and Death it self. For look how much *blood* is according to *Art* taken away, so many years are added to the *Age*.

Nature her self was our Tutor here, whom *Physicians* transcribe: for She, of her own accord, doth many times vanquish the most mortal *Infirmities* by a plentiful and critical evacuation, either at the *Nose*, *Hæmorrhoids*, or by *menstruous Purgations*. And therefore young people, who feed high, and live idly, unless about the eighteenth or twentieth
years

year of their age (at which time the stock of blood increases, together with the bulk of their bodies) they be disburdened of the load and oppression of their blood, either by a spontaneous release at the Nose, or Inferiour parts, or by breathing a Vein, they are dangerously set upon by Feavers, Small-pox, Head-aches, and other more grievous Distempers and Symptoms. Alluding to which, the Farriers, do begin almost all Cures of Beasts with Letting blood.

*What Observations are to be collected
from the Ramifications of
the Umbilical veines
in the Egge.*

EXERCIT. LIII.

WE see the Blood is made in the Egge and Conception before any thing else; and neere upon that time, doe its Receptacles, that is, the Veines, and Vesicula pulsans appear. And therefore if we admit the Punctum saliens, together with the blood and veines, as one and the same Organical part, visible in the first dawning of the Fetus, to stand for the Heart (whose Parenchyma doth afterwards, in the formation of the Fetus, grow to the Vesicula;) it is clear then, that the Heart under this acceptation (namely, as an Organ compounded of a Parenchyma, Ventricles, Deaf-ears, Vessels, and Blood) is truly (according to Aristotles owne minde)

minde) the principal and primary part of the body: and yet its first and chief part is blood; and that not onely in order of Nature, but of Generation too.

The parts next in Generation to the blood, are the *Veines*: for the blood must needs be kept in vessels. And therefore (as *Aristotle* observed) there are found two venal Channels neer upon the very beginnings of all, which do afterwards (as we have taught in our History) constitute the *Umbilical vessels*.

From their Scituation therefore and Ramification, some things come to be observed. The First is, that all the *Veins* and *Arteries* arise from the heart; for they are as so many retainers belonging to the Heart, or as certain parts of it. If therefore you diligently observe a (*humane* or any other) *fetus* new born, and cutting in sunder the *Vena Cava* between the right *Auricle* of the Heart, and the *Diaphragma*, if you mark it as it looks downwards, you shall discover three Holes, whereof the greatest and hinder-most tending towards the *Spine* of the back, is the Hole of the descending *Vena Cava*; the fore-most, and lesser, is carried into the Root and Trunk of the *Umbilical vessels*; the third, and the left of all, passeth into the *Liver*, and is the Fountain and Trunk of all the branches disseminated into the *Gibbous* part of the *Liver*. By which it is evident, that the veins do not (as some would have it) proceed from the *Liver*, as from their Original, but from the Heart: unless they will obstinately affirm, that the Trunk and body of a vein arises from some litle branch of the vein, and not the branches from the Trunk.

Moreover, since the fore-said vessels in the Egg, are alike disseminated into the Yolk and White (after

(after the manner as *Plants* work in their *Roots* into the *Ground*) it appears, that both their *liquours* are the nutriment of the *Fetus*, and that that nourishment is by these *Vessels* conveyed unto it : and that against *Aristotle*, who every where affirms, that the *Chicken* assumes nourishment by the *Navel*, De hist.an. l. 2. c. 3. *only from the Yolk*, but is made of the *White*. De gen.an. l. 3. c. 1. & 3. The *White* indeed is first spent, and the *Yolke*, though late, doth yet at last become the Nutriment, and supplies the place of *Milk* when the *Chicken* is now hatcht : to the intent, that Nature might afford to *Oviparous* creatures such an aliment as she holds out to *Viviparous* by the *Breasts*, or *Udder*. Hereupon it falls out, that when all the *White* is exhausted, the *Yolk* continues almost entire, even when the *Chicken* is consummate, and complete ; nay, even after his Exclusion.

Aristotle, indeed, ten dayes after the *Chickens* exclusion, found some remainder of the *Yolk* in the *Chicken* : but I have observed even after six weeks time, some part of it fastned to the *Guts* in the *Chickens* belly.

Yet upon the reception of the *Yolk* into the *Abdomen* of the *Chicken*, (which while the *Fetus* is forming, and growing, doth not abate so much as the *White*, but continues almost entire, when both the *Whites* are now quite wasted) and also upon the Observation at the Distribution of the *Veines* through the substance of the *Yolk* : all which being collected into one *Trunk*, do pass into the *Vena Porta*, and do carry part of the *Yolk* thither, to receive a further concoction in the *Liver* ; upon these, I say, and such like grounds, I cannot but acknowledge with *Aristotle*, that the *Yolk* doth nourish the *Chicken*, and hath some analogie to *Milke*.

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The *Yolk* doth not remain entire after the Consummation of the *Fetus*, for a portion of it is dissolved in the first conformation of the *Chicken*; and it likewise doth admit the propagations of the *Veines* (as well as the *White*) by which after it is now prepared, it becomes the Nutriment of the *Fetus*: yet certain it is, that the greatest part of it doth survive the wasted *white*, and that surviving part is entertained into the belly of the *Chicken*; and being attracted by the small branches of the *Vena Porta*, is at last conveyed into the *Liver*.

It is therefore a clear case, that the *Chicken* newly hatched, (while it is yet weak and tender) is nourished by the *yolk*. And as while he remained within the *Egge*, he was partly fed by the *yolke*, and partly by the *whites*, but chiefly by the hospitality of the *whites*, which as they are in greater quantity, so are they sooner exhausted: so in like manner, when he is now hatched, (at which time all his aliment passeth through his *Liver*, and there receives a farther preparation) he is nourished partly by the *yolk* attracted from the *Guts*, and partly by the *Chyle*, which the several propagations of the *Meseraick Veines* suck into themselves; when there is in the *yolk* onely one propagation of the *Vena Porta* distributed into it, and a litle onely of the *yolk* remaining. For *Nature*, as *Nurses*, being about to wean their *Infants* by degrees, gives them other meats sometimes, that so they may the better endure the decay of the *milk*: so the *Chicken* is trained by degrees, from meat of easier concoction, to harder (as from the *Yolk*, to the *Chyle*.)

Therefore what we see of the propagation of the *Veines* in the *Egge*, is done upon exceeding good grounds. For as soon as the *Chicken* begins first to be modelled, the *Veines* are then extended only in-

to

to the *Colliquamentum*; by which the blood being fed and grown, adjoyns the rest of the body to himself, to be brought up with him. Afterwards, the veines reach into the thinner *white*, from whence the Chicken receiveth his sustenance, (while he yet resembleth a *Gelly*, or *Mucilage*, and a *Maggot*) afterwards they spread into the thicker *White*, and anon into the *Yolk*, that by that also it may be entertained; and being as yet but tender, it is fed in part by the *yolk* (as by *milke*) hoarded up in the *abdomen*, and in part by food provided and prepared by the *Hen*, till it be able to seek abroad for nourishment convenient, and can digest it. So that through the whole series of Generation, Nature hath most prudently considered of various Aliment proportionable to the various abilities of the *Digestive faculty* of the future *Fetus*. For while it is yet feeble, she hath provided it milder diet, and solider meats for its stronger capacity; and when it is now hearty enough, and can away with courser cates, it is served with commons answerable to it. And hereupon I conceive, that perfect eggs are not onely party-coloured, but also furnished with a double *White*.

And what we have found out by Experience, *De gen. an.* seems also to agree with *Aristotles* opinion, where *l. 3. c. 1.* he saith, That Part of it which is hotter, comes neerer the form designed to the institution of the members, but that which is carthier, yeelds matter to frame the body, and is more unlike. As in party-coloured eggs, the animal assumes the Rudiments of its generation from the *White*, (for the animals beginning is in the hot part) and its aliment from the *yolk*. Therefore in hotter animals, those two are reserved apart; namely, that from whence they take the beginning of their being, and that from

from whence they derive their aliment, and one of them is white, and the other yellow.

It appears by what hath been said, that the *Chicken* (and the same thing shall afterwards be demonstrated of all conceptions) as he results, or is framed from the implanted principle, or soul of the *egge*, so he also obtains his nourishment from the *Egge* too: wherefore he hath no need of a mother, as the *Plants* have of the *Earth*.

And it is no truer of him, that he is nourished by his mothers blood, or lives by her spirits; and so his own heart lies fallow and idle the while, then that he moves and perceives by his mothers organs, or is enlivened and takes growth from her soul. But the case is plain, and all men acknowledge, that the *Fetus* is fed by the *Umbilical Vessels*; and that the *Venal branches* disseminated into the *White* and *Yolk*, do hence derive sustenance, which they impart to the *Fetus*.

It is likewise clear, that when the *Chicken* is now hatched, or excluded, he is supplied with provisions, partly from the *Yolk*, and partly from the *Chyle*; and that they both pass into the *Liver* by the same *Vena Porta*, though by several branches of it.

It is also clear, (to speak by the way) that the *Chyle* which nourisheth all living creatures, is transported by the *Meseraick Veins* out of the *Guts*; and that there is no need to search out new wayes (namely the *Vena Lactea*) or to fantasie any other passage in grown bodies, besides what we finde in the *Egge* and *Chicken*. But as for the Inconveniences of that invention, we shall elsewhere discover them.

Lastly, by the constitution of the *Umbilical Vessels* in the *Egge*, (whereof we have declared some

to be *Veines*, and some *Arteries*) we may collect a *Circulation of the Blood*, (such as we have long since demonstrated in our Book, *de Motu Sanguinis in Animalibus*) and that for *vegetation*, *nutrition*, and *augmentation* sake : and therefore the *Umbilical Vessels* are disseminated into both the *Liquors*, that they may lead sustenance from them to the *fetus* ; and the *Arteries* are derived thither too, that by a plentiful affluence of *heat* they may *concoct*, *dissolve*, and render the aliment usefull to *nutrition*.

And hence it comes to pass, that wheresoever the *veines* (and under that name the *Arteries* also are here comprehended) do arrive to the substance of the *White or Yolk*, those parts seem to be dissolved, and put on a different look or appearance from the rest. For so soon as ever the *branches* of the *Veines* shoot forth, the *superiour* or *exteriour* part of the *White* (into which they are inserted) grows transparent, and melts into a *Colliquation* ; but the *inferiour* part remaining still thick, and compact, is confined to the *lower angle* of the *Edge*. So likewise there seem to be two parts (a *superiour* and an *inferiour*) of the *Yolk*, which do as much differ from one another, as *melted* from *unmelted Wax* ; namely, that part which hath entertained *Veines* into it, from the other which is yet destitute.

Hence also we are acquainted with the *Exordium*, and first inherent principle of the *Edge*. For it is clear, that the *Cicatricula*, or *Spack*, is the principal particle of the *Edge*, to which all the rest are to be referred, and to which (if to any part before another) whatsoever it be, which makes the *Edge* *proliferal*, is to be imputed, as also the first onset towards the *generation* of the *Chicken*. And therefore (as we have shewed) presently after the *Incu-*
bation

bation of the Hen; the *Cicatricula* is first of all dilated, enlarged, and makes a *Colligation*; where in forthwith the *blood* moves, the *veines* are scattered, and the operations and effects of the native heat, do by the help of the formative Operatour, betray themselves; and by how much the deeper the small *Filaments* of these *veines* do take rooting, by so much the wider is the *Empire* of the *Vital faculty* advanced, and the *Majesty* of the *Vegetal Soul* revealed. For indeed every Effect is a cleare testimony of its Efficient.

In a word, upon the *Cicatricula* (wherein the first twy-light of native heat doth dawn) the whole *Generation* doth depend: Upon the *Heart*, the whole *Chicken*, and upon the *Umbilical Vessels*, all the *Membranes* involving the *Fetus* (which we call the *Secundine*) do rely. Wherefore we conclude, that the parts of the *Fetus* are in subordination one to the other, and do first borrow life from the *Heart*.

Of the Order of parts in the Generation out of an Egge, according to Fabricius.

EXERCITATION LIV.

IT being now resolved, which is to be esteemed the first part, namely the *Blood*, with its *Receptacles*, the *Heart*, *Veins*, and *Arteries*; it now follows, that we discover in what order all the parts of the *Body* are generated.

Fabricius

Fabricius (whose steps we trace in the Generation of the *Pullus*) ere he proceed to the order of the Parts, doth first recite the actions discovered in an Egge, and by whole assistance the Parts are formed; repeating also in order their Faculties: as if out of them the order also of the Generation of the Parts may be more clearly discovered. There are three actions, saith he, which appear first in an Egge upon which the Hen sits: the first is, the Generation of the Chicken; the second, its Growth; the third, its Nutrition. The first, that is, the Generation, is the proper action of the Egge; the second and third (namely accretion and nutrition) do for the greatest part come to a height out of the egge; yet they are begun in the egge, and perfected there too. Which actions, as they flow from three faculties, (the Generative, Augmentative, & Nutritive) so three Effects do ensue upon them: For from generation do all the parts of the Chicken result; from accretion and nutrition, Growth, and Increase: treating first of the Generation of the Chicken, we may discover, that by the help of Generation the parts of the Chicken (which were not before) are produced, and so the Egge is transformed into the body of the Chicken. Now while any part doth commigrate into another, it must needs pass through a commutation of its own proper essence; (for otherwise it must continue the same thing still) and also must be fashioned into a figure, scite, and magnitude convenient and consistent with its nature: and in these two things is the Procreation of a substance absolved, namely, Commutation, and Conformation; therefore the Immutative and Formative faculties, are the causes of these functions: Whereof the One hath produced each particular part of the body, just as we see it, out of the Chalaza of the Egge; the Other conferred the figure, scite, and composition convenient for all the several uses of it.

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The first of these Faculties, which is the *Immutative* or *Alterative* faculty, is wholly natural, and doth act without any knowledge at all; and taking to it self, the hot, the cold, the moist, and the dry parts, it alters the whole substance of the *Chalaza* throughout, and by altering, it doth change it into the parts of the *Chicken*; that is to say, into *Flesh*, *Bones*, *Gristles*, *Ligaments*, *Veines*, *Arteries*, *Nerves*, and into all the other similar and simple parts of the *Animal*, or *Chicken*: and the *Cocks* seed doth by its proper ingenit heat and spirit, generate, create, and produce them out of the *EGGE* (that is, the *Chalaza*) by *Alteration* and *Commution*; imparting to every one of them its proper substance, and the proprieties belonging to that substance. The Other faculty which is called *Formative*, and which makes the similar parts dissimilar (bestowing their beauty upon them, from convenient figure, just dimension, proper scite, and competent number) being much more noble then the former, and full of incomparable wisdom, doth not act Naturally, but by *Election* or *Choice*, *Knowledge*, and *Understanding*. For truly this *Formative* faculty seems to be stored with most exact knowledge, and provision, both of the future *Action*, and also of the *Use* of every particular *Part*, and *Organ*. And thus of the first *Action* of the *EGGE*, which is the generation of the *Chicken*, to whose celebration, both the seed of the *Cock*, as *Agent*, and *Fructifier*, and the *Chalaza*, is required, as the subject Matter. Next comes *Accretion*, which is done by *Nutrition*; whose Faculties are the *Attractive*, the *Retentive*, the *Digestive*, and *Expulsive* faculties: and lastly, the Faculty of *Apposition*, *Agglutination*, and *Affimilation*.

But as for this distribution of the *Actions*, I conceive it neither to be right, nor useful, nor pertinent in this place. Not *Right*; because those actions, which he seems to hold to be distinct, in their

their species, and time; namely that the parts should be first made similar, by the *Immutative* faculty; after that, formed, and made *Organicall* by the formative; and then *augmented* by the augmentative) do no where appear so in the Generation of the Chicken; for the parts are all generated, distinguished, and augmented together. For though it be otherwise in the Generation of those Animals which are framed by a *Metamorphosis*; where all the parts are transformed, and lineated out of a *pre-existent matter*, which is large enough, and prepared before hand; (as when out of a Worme is made a Butterfly, and out of another Worme a Silk-Worme) yet in Generation by *Epigenesis*, the business is much otherwise, nor is the proceeding there, as it is in *Nutrition*, which is performed by the divers *actions* of diverse parts, joining their confederate forces and helps together: namely, where the *Aliment* is first attracted and retained; then concocted, then distributed, and at last agglutinated. Nor is the similar constitution produced by the *Alterative* faculty, without all kind of providence (as *Fabricius* would have it) And the *Organical*, by the *Formative*, which imployes knowledge and providence in her undertakings. For Generation and Accretion, are not made without Nutrition, nor Nutrition, or Augmentation, without Generation. For to Nourish, is to substitute into the place of that which is lost, as much, and such as is lost: namely, *Flesh*, or *Nerves*, into the roome of that *Flesh*, and those *Nerves*, which are impaired. And what is this other, then to make *Flesh*, or *Nerves*? So likewise *Accretion* is not without Generation: For all *Natural bodies*, are *Augmented*, by a new accession of those parts, of which they did consist

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before: and that according to all *dimensions*: So that they at once do grow, are distinguished, and organized together,

And now, to *Generate a Chicken, is nothing else, but to constitute all its parts, members and organs*: which though they are made in order, and some are *post-genit*, or *later productions* then others (as the *lesse principal parts*, compared with the *more principal*) yet while the *organs* themselves are distinguished, their generation doth not proceed in such order, that the *similar parts* must be first made, and the *organical* be afterwards compounded out of them: as if the compounding parts were first to exist, and then the *Composition* to be raised out of them. For though the Head of the Chicken, and the rest of its Trunk, or corporature (being first of a similar constitution) do resemble a *Mucus*, or a soft *glewey substance*: out of which afterwards all the *parts* are framed in their order: yet by the same operation, and the same Operatour, they are together *made* and *augmented*: and as that substance resembling *glew* doth grow, so are the parts distinguished. Namely, they are *Generated*, *Altered*, and *formed* at once: they are at once *similar* and *dissimilar*: and from a small *similar*, is a great *organ* made. In the same manner as out of the straw, the spike, reeds, and graines do arise, and are distinguished: and as the Trees, when they shoot forth their young buds, do out of them, expand and produce flowers, leaves, fruit, and at last, seed.

And this we have learnt out of those things which are conspicuous in an egge, by diligent observation of them. For by the effects, the actions, or operations are perceived; by the operations, the faculties, and by them, the Operatour
or

or Efficient. Wherefore in the Generation of the Chicken, the actions or faculties of the *Generant* (which *Fabricius* recites; namely, the *Immutative* and *Formative*) do not differ *Specie*, nor yet *secundum prius & posterius*, but (as *Aristotle* useth to speak) *ipso esse*, and *ratione solum*: not as it befalls the actions of the *nutritive faculty*, after the birth, (to wit, Attraction, Concoction, Distribution, and Apposition) which performe their duties in several places, and at several times. For otherwise the Generative faculty her self, should be informed also to use diverse instruments to perform her several operations.

Wherefore *Fabricius* affirms amisse, that the *Immutative Faculty* doth operate by the qualities of the *Elements*, namely, Heat, Cold, Moisture, and Dryness: (as being its instruments) but that the *formative* works without them, and after a more divine manner: as if (forsooth) she did finish her task, with meditation, choise, and providence. For had he looked deeper into the thing, he would have seen, that the *Formative*, as well as the *Alterative faculty* makes use of hot, cold, moist, and dry, (as her instruments) & would have deprehended as much divinity and skill, in Nutrition and Immutation, as in the operations of the *Formative faculty* her self. For *nature* hath instituted all those faculties for some end; and doth every where work with providence, and understanding. Whatsoever it is which makes the seed of Plants fruitful, and doth exercise a plastick virtue in it: and that which in an *egg* executes the office of a most skilful Workeman, doth produce and build the parts, and by Calefying, Refrigerating, Moistning, Drying, Concocting, Condensing, Hardning, Softning, Dissolving, both Fashion, and

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Augment them; doth also distinguish them, by Figure, Scite, Constitution, Temperature, Number, and Order: disposing and compleating all things, with like providence, election, and understanding, (no lesse in the alteration, then nutrition, augmentation, and formation of them.)

I say the Concocting, and Immutative; the Nutritive, and Augmenting faculties; (which *Fabricius* would have to busie themselves onely about Hot, Cold, Moist, and Dry, without all knowledge) do operate with as much artifice, and as much to a designed end, as the Formative faculty: which he affirms, to possess the *knowledge and fore-sight of the future action, and use of every particular part, and Organ.*

As the Art of *Physick*, the Bakers and the Cooke slight (which set on work, the hot, cold, moist, and dry, and such like natural Instruments) doe no less require the exercise of reason, then Mechanical Trades, which either work with their own hand, (as the Smith, the Statuaries, and the Potters) or other artificial instruments. But as in the greater world, we say, *Jovis omnia plena*, All things are full of the Deity, so also in the little edifice of a Chicken, and all its actions and operations, *Digitus Dei*, the Finger of God, or the God of Nature, doth reveal himself.

Therefore if it be lawful for us to judge of the faculties by the operations; the Vegetal Operations do rather seem to be executed by Art, Election, and Providence; then the very actions of the Rational soul, and the Mind, though in a most perfect man, the top and pinnacle of whose Knowledge and Understanding, consists chiefly (according to *Apollon*s verdict) in this, *ut noscat se ipsum*, that he know himself. A more sublime, and
diviner

diviner Artificer therefore (then man is) seems to make and preserve man : and a *abler Agent* then a *Cock*, doth produce a *Chicken* out of the *Egge*. For we acknowledge our *Omnipotent God*, and most high *Creator*, to be every where present in the *structure* of all creatures living ; and to point himself out by his *Workes* ; whose Instruments the *Cock* and *Hen* are in the Generation of the *Chicken*. For it is most apparent, that in the Generation of the *Chicken* out of the *egge*, all things are set up and formed, with a most singular *providence*, *divine wisdom*, and an *admirable*, and *Incomprehensible Artifice*.

Nor can these *Attributes* appertain to any, but to the *Omnipotent Maker of all things*, under what name soever we cloud and veil him : whether it be, *Mens divina*, the divine *Mind*, with *Aristotle*, or *Anima mundi*, the soul of the Universe, with *Plato* ; or with others, *Natura Naturans*, Nature of Nature her self ; or else *Saturnus*, or *Jupiter*, with the *Heathen* ; or rather, as befits us, the *Creatour*, and *Father of all things in Heaven*, and *Earth* : upon whom all *Animals*, and their *births* depend : and at whose *Beck*, or *Mandat*, all things are created, and begotten.

Moreover (as I have observed) this *distribution* of the *Actions*, or *faculties* of the *Soul* (which *Fabricius* doth premise to the order of Generation of the *parts*) as I apprehend it to be faulty, so also I conceive it to be unprofitable and inconvenient, or impertinent to our business. For we doe not attain to the knowledge of the *Effect*, by the knowledge of the actions or faculties, but rather on the contrary, from the *Effects* we ascend to the *Faculties* ; for the effects or workes are *notiora nobis*, more known unto us, then the faculties

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from whence they spring : and the parts (which we see made already) are more intelligible in Generation, then the actions which framed them.

Nor do those things which are to be considered and determined in the general observation of all *Animals*, fall properly within the compass of the particular generation of the *Chicken* out of the *Egg*. But of them more hereafter.

In the mean time, we shall proceed to the Order of the Generation of the parts. It remaines, saith *Fabricius*, that we consider and contemplate in what Order, that is, which part is made first, and which after in the *Egg*. In prosecution whereof there are two foundations to be laid : one in respect of the body : the other in relation to the incorporeal substance, as, the Nature or Soul. I call that (saith he) the Corporeal foundation, which depends upon, and flows from the Nature of the body ; and whereof an instance is easily deduced from things made by art : For, as every edifice doth first require a foundation, upon which the whole frame is to be laid and supported : whence the walls are set up, which do sustaine the Floors and Roofe : and then the Household-stuff, and other furniture are introduced ; so doth nature proceed in the Fabrick of *Animals*. For first she laies the Bones as the foundation, that all the parts of the Body may grow to, hang, upon, and be established by them. Which bones are first made under another capacity. For since Bones take their first rise from a most soft and membranous substance, and doe afterwards attaine their induration ; therefore much time must be allotted to the Generation of the Bones, that so they may become the hardest parts ; and hereupon they are begotten first. And for this reason *Galen* did not compare the structure of an *Animal* to every kind of building, but chiefly to that of a Ship. For, saith he, as the foundation

dation and original of the Ship is the Keel, from which the sides, or planks imbowed, and placed at a distance one from the other (like a Hurdle) are set up on both sides, that so the whole frame of the Ship may be afterwards finished out of the Keel, as a convenient foundation; So in the fabrick of an Animal, Nature first stretcheth out the Chine bone, with the Ribbes drawn round it, as the Keel, and congruous principle, whereon she foundeth and finisheth the whole Pile.

But Experience doth abundantly confute this phansie: for it is evident, that the Bones are rather made last of all. For the Bones of the Limbs, the Skull and Teeth, are not made before the Brain, the Muscles, and fleshey parts; but even after the nativity, in the tender, and (otherwise) perfect *fetus*, they are onely Gristles, and Membranes, and afterwards in tract of time arrive to the solidity of Bones, as doth appear by Infants Skulls, and the Ribbes and Joints of Embryo's.

And though it be true, that the first platforme of the body appears like a Bent or incurved Keel, yet is it of a soft, mucous, and glutinous consistence, no way resembling either the Nature, Constitution, or Office of a Bone. As also the small Globous bodies which are its appendixes (designed for the parts of the Head) have no solidity at all in them, but are onely Vesicles stuffed with clear water, which are afterward transformed into the Braine, After-braine, and Eyes; and are at last fenced with the Skull, namely, after the Bill, and Claws have attained solidity, and obduration.

Wherefore this Contemplation of Fabricius is a sleepy, and injurious one; He not considering what really is done by nature in the order of Generation, but rather what nature according to his phan-

314. *Of the Order of the parts in an Egge, Ex.LIV.*

phantie, ought to have done ; as if Nature did imitate Art, and Art were not rather *Natures Ape*. Which coming into his head, himself afterwards
 pag. 44. saith, *Satius fuerit dicere, &c. It is a more deliberate assertion to say, that Art was Natures Scholar, and wrought by her Copy: because as Galen every where pronounceth, Nature is of more Antiquity, and wiser in her productions then Art.*

And though the bones are the foundation of the whole body, without which it can nor stand nor move : yet it is sufficient for them, if they are made together with those parts, which do rely upon them. For where the things which are to be upheld are not in being, the Props are provided to no purpose. But nature doth nothing rashly ; nor constitutes parts, before there is use of them. But all Animals attaine their parts, so soon as action and usefulness is required of them, And therefore this first foundation of *Fabricius* his laying, countenanced by his own observations in the Egge, and *Galens simile*, is clean demolished.

He seems to come neerer the Mark, when hee saith, *The other foundation of producing the parts in order, is desumed from Nature, that is, the soul; which is Queen Regent of the animal body.* For since there are two degrees of the soul, the *Vegetal* and *Sensative*; and the *Vegetal* is, tempore & naturâ prior, first both in time and nature, because it is common to the very Plants ; doubtless the Instruments subservient to the *Vegetal*, are first to be made and fitted, before those that attend the sensitive and motive faculties : especially the more principal ones, and where the *Queen keeps Court*. Now these are chiefly two, the *Liver*, and the *Heart* : the *Liver* as the throne of the *Vegetal* or *Nutritive* : and the *Heart* as that *Minister of State*,
 who,

who by his heat and warmth, doth enliven and compleat both the Vegetal, and other Faculties, and therefore holds a strong league and confederacy with the Vegetal. Wherefore if after three dayes Incubation, you discern in that part of the egge where the Chicken is bred, the heart panting, (as Aristotle also testifieth) muse not at it, but conclude that the heart relates to the vegetal Faculty, and is therefore the first begotten. Now it is also consonant to Reason, that the Liver also should be Twinne to the Heart, and born with it, but doth not appear, because he wants a palpitation, which the Heart hath. For even Aristotle himself saith, That the Liver and the Heart are constituted in the body upon like grounds; so that if there be a Heart, there must be a Liver too. If therefore the Liver and Heart are first begotten, it also followes, that the other Organs that are menial servants relating to these two, should be begotten together with them; as, the Lungs for the Heart; and for the Liver, almost all the parts which are contained in the Lower Belly.

But all this is very wide from that order and progress which we see in the Egge. Nor is it true, that the Liver is born together with the Heart: nor will that shift serve his turn, where he pretends, *Latere Jecur, quia non palpitat*, that the Liver lyeth concealed, because it is not exposed by palpitation. For the Eyes, the Vena Cava, and the Carina, the Keel, are discerned even from the very first, yet have they no palpitation. What impediment then to barre the Liver and Lungs (if they are then in being) from being seen? Nay, he himself, in his Figure or Table, representing the fourth day, hath described a small Point in the midst, and yet he hath not signified any palpitation belonging to it; nor did he own it for the Heart, but supposed it to be the first rudiment of the body: wherefore

fore he speaks onely out of conjecture, and pre-entertained opinion, when he proclaims the Principality of the Liver: as other men have also done, (namely, *Aldrovandus*, and *Parisianus*) who casually lighting upon two Points, and could not discover a Pulse in both, at one and the same time, conceived the one to be the Heart, and the other the Liver. As if the Liver had any pulse at all; but those two Points are the two *Vesicula Pul-santes*, returning answer to each other in alternate contractions; as hath been noted in our History.

Wherefore, either *Fabricius* is deceived, or doth deceive, where he saith, Presently in the first progress of generation, the Liver, Heart, Veines, Arteries, Lungs, and all the parts contained in the lower belly; likewise the Keel, that is, the Head, with the Eyes, and the whole Spine and Chest, are born and framed. For the Heart, Veins, and Arteries, are perfectly distinguished, for some time, before the Keel; and the Carina, or Keel, before the Eyes; and the Eyes, the Bill, and Sides, before the Members contained in the lower belly: and also the Stomack, and Guts, before the Liver, or Lungs, are discerned. And that order is observed in generation, which we shall presently describe.

He is likewise deceived, when he decrees the Vegetal part to have a being both in time and nature before the sensitive and the motive. For that which is first in Nature, is for the most part after, in the order of Generation. In time, indeed, the Vegetal part is before, because the sensitive soule cannot be without it. For it cannot actually exist in the body without Organs, it being *Actus corporis Organici*, the Act of the Organical body: but the sensitive and motive Organs, are the workmanship of the vegetative; and the sensitive
soul

soul (before it actually exist) is *tanquam* *Trigonus* in *Tetragono*, like a *Triangle* in a *Quadrangle*. But Nature first intends that which is most principal and noble; and therefore the *Vegetal faculty* is after in the order of Nature, as being subservient to the *sensitive*, and *motive Faculty*.

Of the Order of Parts in Generation, according to Aristotle.

EXER. LV.

That which relates to the order of Generation, according to Aristotle, is thus: When the Con- De gen.an. l. 2. c. 4. ception is ordained, it proceeds as Seeds do. For Seeds also have a first Principle in themselves; which being first contained in *potentiâ*, when by and by it is severed, it sends forth a bud, and a root, whereby it attracts aliment; for it requires growth. So in some sort in a conception, where the parts are all in *potentiâ*, the Principle is chiefly active.

This Principle in an Egg (analogous to the blossom of Plants) we with Fabricius call *Macula*, a Speck, or *Cicatricula*, a small Cicatrice: which we have avouched to be the principal particle, in which all the other parts are in *potentiâ*, & whence afterwards they arise in their order. For in it is contained that thing (be it what it will) which renders the Egg prolific; and there is the first effect of the vegetal beat, and operation of the Forming faculty first discovered.

Macula isthac, that Speck (as hath been shewed) is presently dilated after incubation, and divided into

into Circles; in whose Center a small white Point (like the *Cicatricula*, in the ball of the Eye) doth display it self: where by and by the *Punctum rubrum*, the Red point, is discovered panting, with the capillary branches of Veines containing blood; and that presently, so soon as ever the *Colliquamentum* by us mentioned, is framed of that *Macula*.

Ibid.

Wherefore Aristotle proceeds; The Heart is first actually discerned; and that not onely discoverable to sense, but according to reason. For since that which is begotten is now disjoyned from both parents, it ought to demean, govern, and dispose of it self, as a Son set free by his Father, and seated apart. And therefore a Principle, and that an Intrinfecal one, must needs be had, by which afterwards the order of the Parts is to be prescribed, and all things relating to the complement of the Animal, managed, and disposed. For if it were Extrinfecal at any time, and afterwards began to enter in, you would not only be in suspense, and question when it went in, but conclude, that since each part is distinguished, it was necessary that part should subsist, out of which both growth and motion is conferred upon the other parts. In another place he saith, The first Principle is a part of the whole, and not any separate thing, which is contained apart from it. For, saith he, when the Animal is now generated, is that Principle corrupted, or doth it remain? Now nothing seems to be in, which is not a part of the whole, be it Plant, or Animal. And that it should be corrupted, when it hath been at the expence of making all, or some of the parts, is very absurd; for what shall make the remainder? Wherefore (he proceeds) who side with Democritus, saying, That the exterior parts of the Animal are first made, and then the interior: as if they were to build a wodden or stony Animal, do not say well; for such a creature as that hath no Principle in it self. But all Animals

animals

animals have, and contain one within them. Whereupon the Heart is first seen in all Animals, in which there is blood ; for that is the Principle of the similar, and dissimilar parts. Now that thing which requires Aliment, ought already to have received that principle of an Animal, and constituted Fœtus.

Which words do plainly declare, that Aristotle did conclude of an Order in the Generation of Animals, and of a Principal part, namely, the Heart, which (like a Son at liberty) is the first animate, and primogenit part of the Animal, contained, and abiding in it : whence not onely the method of the parts is set down, but the Animal it self, preserved, and relies upon it, receiving continual life and sustenance ; and that thence, whatsoever is necessary to the perfection of the Animal, is derived. For, (as Seneca saith) in the Seed is the whole Nat. quest. accompt of the future Man comprehended. And the Infant yet unborn hath a Standard and Commission for a Beard, and a Gray-head. For the dimension of his body, and ensuing yeares, are already deciphered in a small, mysterious character.

Now whether the Heart be the Primigenial part, or no, we have determined above. To wit, if Aristotles speech be understood of that part, which (in the Anatomy of Living creatures) is seen by the eye to be before the rest, (that is, of the Punctum saliens, together with the Veines streaming with blood) we cheerfully embrace his judgement. For we believe, that the Blood, together with the Vessels, and Instruments ; namely, the Umbilical Veines, (by which, as by Roots, the Nutriment is attracted) and Vesiculæ pulsantes (to whom it is distributed for the life and growth of the parts) is constituted before any other. For (as Aristotle saith) the matter by which any thing is augmented,
and

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and out of which it is first made, is one and the same.

But they are much abused, who conceive, that the diverse parts of the Body are sustained with a diverse aliment. As though Nutrition were nothing but a bare choice, and attraction of aliment: and that no concoction, assimilation, apposition, and transmutation, were required of the particular parts which are to be nourished: which was the opinion

Lucret. l. i. on of *Anaxagoras* of old.

*Principium Rerum qui dixit Homæomeriam;
Ossu videlicet è paucillis atque minutis
Ossibus; sic & de paucillis atque minutis
Visceribus, Viscus gigni: sanguenque creati,
Sanguinis inter se multis coeuntibu' guttis.*

Who said, that Things from their Like-
parts begin;
That Bones from less, and fewer Bones
do spring;
And Intrals rise from Intrals, Blood
from Blood,
Where the Confederate drops make up
the Flood.

In the place before cited. But *Aristotle* most truly saith: Distinction of parts is not, as some suppose, upon that ground, that Like is of its own nature tending to its Like: for besides many other difficulties which beset that opinion, it will follow, that every similar part must be ordained apart by it self: as for instance; Bones by themselves, Nerves, and Flesh by themselves, in case that opinion be admitted. But, indeed, the Nutriment of all parts is common and similar, as the Yolk in the Egge; and not heterogeneous, and compounded of diverse parts. And therefore what we have said concerning

ing the *matter* out of which the Parts are made : we pronounce the same of the *matter* out of which they are augmented ; namely, that the parts do assume their Nourishment out of that *matter* , in which all the Parts are *in potentiâ*, but none *actu*.

As out of the same *Showre* all kinds of *Plants* take growth, because that moisture, which was before like *in potentiâ* to them all, is now made like them *actu*, being transformed into their *substances*; And is also bitter in *Rue*, sharp in the *Mustard*, and sweet in *Licorise* ; and so in the rest.

He goes on, to explain what Parts are generated before others ; and that with a reason not much unlike *Fabricius* his *Fundamentum secundum*, his second ground or foundation, saying, *Id cujus causâ, & quod ejus causâ, differunt ; & alterum generatione, alterum essentiâ prius est* ; namely, the *End* is first in *Nature* and *Essence*, in respect of that thing which is made for the *Ends* sake ; but That which is made for the *Ends* sake, must needs be first in *Generation*. And by that Argument *Fabricius* rightly inferrs, that those Parts which are subservient to the *Vegetative soul*, are all made before those which are instrumental to the *sensitive*, because that is *subordinate* to this.

After this, he subjoines the differences of such things as are made for any *End* ; namely, that some things are instituted for some *End* by *nature*, because the *End* doth ensue upon them : but some, because they are *Instruments* which the *End* makes use of : and those he calls *Genitalia*, but these, *Instrumentalia*. For the *End*, saith he, in some things is *after*, and in some, *before* those things which are their *causes*. For the *Generant* himself, and that which he employes in *Generation*, must needs exist before that which is generated by them.

And therefore the Parts subservient to the *Vegetative soul*, are before those which are retained by *Sense*, and *Motion*. But the Parts dedicated to *Motion* and the *Senses*, are after the *sensitive* and *motive Faculties*; as being *instrumental*, and made use of by the *sensitive* and *motive Faculty*. For by *Natures Law*, no Parts or Instruments are made and constituted, before there be *employment* for them, and a *faculty* be ready at hand, to set them to work. So neither the *Eye*, nor the *Instruments of Motion* are set up, till the *Brain* is built, or the *faculty* be already provided, which is to *See*, or *Move*.

In like manner, because the *Vesiculæ pulsantes* do (as Instruments) minister to the *motion* of the *Blood*; and likewise the whole Frame and Fabrick of the Heart (as we have evidenced in our Book *de Motu Sanguinis*) is *Instrumental*; (namely, that the *Blood* may be continually hurried round the *Body* in a *Circle*) the *Blood* seems to have a being both in *Order of Nature* and *Generation* before the *Heart*; which he employes as an Instrument, having begotten it also, and doth persist to *nourish*, and convey *heat*, *spirits*, & *life* unto it by the *Coronal Artery*.

But how this General Rule of *Aristotle* concerning the *pre-ordering* of the Parts, doth appear to be true by *Anatomical Observation*, we shall declare hereafter. In the mean time, we will enquire, after what manner he himself doth sufficiently deduce the *Causes of Priority*, as I may so say, in *Generation*, according to this Rule.

After the Principle (namely the Heart) are the *Interiour parts* begotten, before the *exteriour*; the *superiour*, before the *inferiour*: for the *inferiour* are for the *superiours* sakes, as being their instrument: after the pattern observed in *Plants*, which shoot forth their *Roots*, before their *Branches*,

But Nature doth not use that method in Generation ; nor is the instance alwayes true ; for in *Beanes, Ciches*, and other *Pulse*, also in *Acornes* or *Mast*, and *Corne*, it is apparent that at the same time , the *Stalk* shootes upward from the same *Bud*, and the *Roots* downward. Likewise *Onions*, and other *bulbous* plants, do germinate upwards before they fix downwards.

But he adjoines another cause of this order ; to wit, *Nature makes nothing superfluous, nor nothing in vaine* , whence it appears, that nothing is made by her, either before or after another, otherwise then need requires. Namely, those parts are first generated, whose uses and functions are first required : some also are sooner begun, because they call for more time to perfect them, that so they may be ready for the birth, together with others that are forwarder then they. As the *Cook* being to provide a feast, where some provisions (by reason of their solidity) aske a slower fire, and longer time to prepare them, he laies them down to the fire first : but to those that are sooner dispatched, and are dressed with a gentler heat, he applyeth himselfe last : and such also as are to be served up in the first course, he makes ready first, but those in the second, last. So likewise nature, in the generation of Animals, is late ere she delineate the moist, soft, and fleshey parts, (as being quickly cooked, and reduced into shape) but for the hard and more solid (as the *bones*) because they exact a large Evaporation, and Exsiccation, and their matter continues long indigested, to them she addresses her selfe first of all. For in the *Braine* also, saith he, the same falls out, namely, that at first it is very moist, and great in quantity : but anon, the humidity evaporating, and being concocted, it growes

Y 2

more

more solid, and so the quantity of the Head, and Eyes, do abate. In the beginning therefore, the Head seems very bigge (in comparison of all the rest of the body, which it much exceeds in bulke) by reason of the Braine: and the eyes very large, by reason of the humour contained in them. But yet the eyes are perfected last; because even the Braine it selfe is long ere it grow to a consistence. For it is long ere it get the mastery, and drein the water, and especially in a Man. For the Sinciput is last confirmed of all the Bones; for that bone is yet soft, even when the Child is born into the World.

He also proceeds to another reason; namely, that the parts are framed of different materials. The more noble parts, (saith he) and those that participate the worthiest principles, are constituted of the concocted, purest, and chiefest aliment: the other necessary parts, made for their sakes, are fashioned out of the baser matter, the reliques, and dregs. For Nature, like a prudent Master of a Family, loseth nothing, out of which he can make any advantage, but so manages the matter in his house, that his Children may fare best, his Servants harder then they, and the scraps or refuse thrown to the Dogs. As therefore, *Incremento jam addito, mens advena facit hæc*, that is, (as I interpret it) a prudent man grown to years of discretion, disposes thus of his Charge; So in the framing of things, Nature (by an inbred wisdom and prudence) formes the flesh, and substance of the instruments of sense, out of the most refined matter, but the Bones, Nerves, Hair, Nailles, Hoofes, and the like, out of the Dregs, (that is the refuse, remainders, or fragments) And therefore these are made last, when nature hath now good store of course materials. And after this, he distinguisheth of two sorts of Aliment; one of Nutrition, the other of Aug-
men-

mentation. That of Nutrition, saith he, doth supply a being to the whole, and all the parts, that of augmentation procureth an accession to the magnitude.

According to what we finde in the *Egge*; where the White (as the more refined *Aliment*) relates to the first Nutrition of the Chicken; the Yolk to its augmentation. And the thinner White (as hath been shewed) conduceth to the formation of the First, and nobler Parts; but the Courser, and the Yolk, to the augmentation of the Nobler, and formation of the more Ignoble. For, he saith, the Nerves are framed as the Bones, out of the seminal and nutritive excrement. But the Nailes, Haire, Spurres, and all like these, are formed out of augmentative, and adventitious meats; which the *Fœtus* both receives from the Mother, and also doth provide of it selfe. And after this he at last gives the reason, why Man (since other *Animals* are provided with their Garments, and Weapons at *Natures* price) should be borne naked, and unarmed; namely, that those kind of parts are constituted of the excrementitious parts, and reliques, but the materials of Men are purer, in which there is very litle terrene, or crude excrement to be found.

And thus far have we made use of *Aristot's*, concerning the Order of Generation: where all seems to be bottomed upon one foundation; namely, *Natures* Perfection; which in all her Workmanship, hath nothing short, nor nothing superfluous, but always disposeth matters for the best. And therefore no part had been precedent or subsequent to one another, if it had been more advantageous to have formed them altogether; which is to be understood of Her, as often as she acts freely, and by choice. For sometimes she acts other-

wise, being as it were under constraint, and put beside her purpose; which happens, when either by defect of matter, or superfluity thereof, or by the default of her instruments, or some outward impediments, she is hindered in her work, and frustrated of her aime, or end. And hence it comes to pass sometimes, that the *final parts* are generated before the *Instrumental*: I call those *final parts*, which employ others, (as their instruments.)

And because some parts are Genital parts, which Nature sets to work about the Generation of other parts, or else to remove some Obstructions in her proceedings, which in case they continue, the Generation may be retarded: and others are under another capacity: therefore it comes to pass, that according to the disposition of the matter, and other requisites, the parts are diversly made some after other, and some of them are in hand before, but are not finished till afterwards: some are begun and finished before others are begun, and others are as soon begun as their fellows, but finished after them. And therefore in the generation of some *Animals*, the same order is not always observed, but it is much different and various; and in some no order at all: but all the parts are begun, and finished at a heat: namely by a *Metamorphosis*, as we shewed. And lastly, hence it happens that the *Primogenit part* is such, that in it is concluded both the *Beginning*, and the *End*; as well that for whose sake all are made (namely the *soul*) as also that which is its cause in chief, and Genital part. The Heart therefore (or, according to my perswasion, the *Blood*) is the first throne of the *Soul*; the fountain of life; the Vital fire; the Genital warmth; and the very *Calidum Innatum*; the first Efficient of all his ministering

string parts , having atcheived the soul for his end, which commands them all as her leige-people. The Heart I say, (as *Aristotle* will have it) is he, for whose sake the whole Fabrick and Family of the parts are provided, and who also is the Fountain, and Father of them all.

*Of the Order of Parts in Generation,
as it appears by our Observations.*

E X E R. L V I.

THat we may at last propose our own opinion of the Order of Parts, as we have collected it out of several Observations of our own ; we intend to distinguish the whole work of Generation (in all *Animals* whatsoever) into two Fabricks.

Whereof the first is that of the Egge ; namely, of the Conception, and Seed, or of that, whatsoever it is , which (in *Spontaneous productions*) answereth in proportion to Seed ; whether we understand it under the notion of *Calidum nativum caeleste in humido primigenio*, the Innate celestial substance, in the Primigenial moist, with *Fernelius*, or with *Aristotle*, of *Calor Vitalis in humore comprehensus* , the vital heat concluded in moisture. For the Conception in Viviparous Animals (as we have said) is answerable to the Seed and Fruit of Plants ; as also the Egge, in Oviparous ; in Spontaneous productions, the Worme, or some *Bulla* teeming by the Vital heat of the contained moisture. In all which the same thing is

comprehended, which may truly call them *Seeds*; namely, out of which, and by which (as the matter, and Efficient, and pre-existent Organ) every *Animal* is first made and borne.

The Other *Fabrick* is of the *Fetus*, born out of the Seed, or Conception. For the Matter, and the Final, and Efficient causes, and the Instruments necessary to the worke, must first be, before any part of the Production can begin.

The *Fabrick* of the *Egge* we have already seen: but that of the *Fetus* (so far as we could discover out of dissections) is perfected (especially in the more perfect race of *Animals*, and such as have blood) chiefly by four degrees, or processions: which according to the several times of generation, we shall reduce into as many Orders; demonstrating withall that the same thing which is discerned in the *Egge*, is alike in every conception and seed.

The First progress is of the *Primogenit*, and *Genital* part, namely of the *blood*, with its receptacles, or if you will have it so, of the *Heart* and his *Veins*.

Now this part is first begotten, chiefly for two reasons, both because it is the principal part, which makes use of all the rest, as its Instruments; and for whose sake the other parts seem to be produced: as also, because it is the *Chiefe Genital* part, the *Fountain* and *Author* of the rest; The part in which is concluded both the *Beginning* and *End* of *Generation*; the same being *Pater & Rex*, *Parent*, and *Sovereign*.

In the *Generation* of these *Parts*, (which is determined in the *Egge* the *Fourth day*) though I could not observe any *Order*; because all its particles (*Blood*, *Veins*, and *Vesicula pulsans*) appear

at once; yet I believe (as I said) that the *blood* is in it, before the *Pulse*: and that it also in *Natures Law*, is before it *receptacles*, the *Veins*: for the substance and structure of the *Heart* (namely the one with its *Ventricles* and *Auricles*) as it is generated long after with the other *Intrals*, so ought it to be registered in their *Classis*, which is the *Third*.

In this structure, the *veines* are conspicuous before the *Arteries*, at least, as farre as we could observe.

The *Second Journal*, which sets out after the *fourth day*, discovers a certain *Concrementum*, or *coagulated substance*, which I call *Vermiculum*, seu *Galbam*, the little *Worm*, or *Magot*; (for it seems to enjoy the life and obscure motion of a *Galba*) and this, as it congeals into a *gelly*, is divided into *two parts*; whereof the *upper* and the *larger* is *conglobated*, and distinguished into *three Vesicles*; namely, that of the *Brain*, *After-brain*, and one of the *Eyes*: but the *lesser*, *carinam referens*, resembling the *Keel* of a *Ship*, is superinduced upon the *Vena Cava*, and is extended according to its length.

In the structure of the *Head*, the *Eyes* are first discerned, and anon a *white spot* starts up for the *Bill*, and the *filme* drying about, it becomes protected by a *membrane*.

At this time also the *adumbration*, or rough draft of the rest of the *Body* seems to succeed; where first upon the *Carina* the *sides* or *planks*, as it were, of a *Boat* seem to arise; being at first of a *similar consistence*, but afterwards by most *white streaks* they are signified to be the lines of the *Ribs*. After this, the *members* of *Motion*, namely, the *Wings* and *Legs* do appear: and at last the *Keel*, and *Limbs* born by a kinde of *Superfatation*, are distin-

distinguished into *Muscles*, *Bones*, and *Joints*.

Those two first mishapen materials of the *Head* and *Body*, do together appear, and are together distinguished : but afterwards, when they tend towards growth and perfection, the *body* gets the start, and is much sooner grown and shaped ; so that the *Head* which did at first out-strip the whole *body* beside, in bulk and magnitude, is now very much short of it. And this is likewise natural to humane productions.

The like Disparity is between the *Body* it selfe & the *Limbs* ; for in an *Infant* (from that time that the *Embryo* exceeds not the length of the Nail of the litle *Finger*, till he be encreased to the stature of a *Frog*, or a *Mouse*) his *Arms* are so short, that if you stretch out his *fingers* over his *breast*, to their farthest extent, they will not be able to touch one another ; and his *thighs* are so short, that being reflected upon his *Abdomen*, they will hardly reach to his *Navel*.

Nay, in Children lately born, the proportion of the bulk of the *Body* is a pretty deal larger then that of the *Limbs*, untill they are able to stand, and go. And therefore *Infants* are first *Dwarfs*, and crawl like *beasts*, & attempt to move on, though upon all four : but go upright they cannot, till the prolixity of their *Legs* and *Thighs* exceed the longitude of the rest of the *Body*. And hence is it, that their first venture to foot it, represents them a prone kinde of *Cattell*, which can scarce exalt themselves to the erection of a *Cock*.

And therefore amongst grown persons, the long *stimmie Fellows*, (whose *Thighs*, but especially their *Shanks*, are longer then ordinary) can stand, walk, run, or vault longer, and at more ease, then *square*, and well trussed men.

In this second Process, several actions of the Formative faculty pursuing one another, may be observed ; (as in the Automata, or engines that go of themselves ; where the fore-going wheel sets his follower upon motion too) and all the parts spring from the same gelly, and similar substance. Not as *De gener.* some Natural Philosophers expound it, who say, that *l. 2. c. 4* Like is hurried unto its like : but we must say, That the parts are moved not by changing their station, but remaining where they were, and altering in softness, hardness, complexion, and those other differences of similar parts ; being now made those things *Actu*, which they were before in *Potentiâ* : that is, the Limbs, the Spine, and the rest of the Body, are altogether formed and encreased, are together described, and complexioned : also the Bones, Flesh, Nerves, and Gristles, which were all similar at first in the same members, and of one kinde of substance, in progress of Time are plainly distinct ; and being conjoined, make up Organical Parts, by whose mutual connexion and continuity the whole body is compiled. So in the Head, the membrane growing every where light, the Brain arrives to its consistence, the Eyes are polished out of a fluid instable moisture.

Nature doth feed and enlarge all the Parts, out of the self same Nutriment, whereof the first did frame them, (not as many will have it, out of a diverse one, and such as is like to every particle) namely, by augmienting her same gelly, or worm : and like a potter, first she divides her materials, and she allots to the Trunk, the Head, and the Limbs, every one their share or cantlin : as Painters do, who first draw the Lineaments, and then lay on the Colours : and as a Ship Carpenter, first layes the Keel for a foundation, and then sets up the Ribs, and Breast-bone, or Deck : and as he builds a boat, so doth

doth *Nature* the Trunk of the Body, and haspon the Joints. And in her work, she begins all the *similary* part out of the same Primitive gelly, or glutinous mass, (namely, the *Bones, Gristles, Flesh, Nerves, &c.*) For at first there appears nothing of the *Bones*, but a kinde of *filaments*, or threddy *fibres*; which afterwards become *nervous*, anon *Gristles*, after that, like *thorns*, and at last down right *Bones*. So likewise the thicker Membrane investing the *Brain*, proceeds first to be *gristly*, and afterwards into a *Skull*: while the thin Membrane doth improve into a *Coat*, or *Pericranium*, and *Flesh*. And in the same Order the *Flesh*, and *Nerves*, out of a yeilding gelly, do concoct and strengthen, into *Muscles, Tendons*, and *Ligaments*: The *braine*, and *after-braine*, from a thin Water, coagulate into a *Callous Curd*; for the *braine* of *Infants*, before the *bones* of the *Synciput* are confirmed, appears soft and fluid, and hath no more coherence, then *coagulated Milk*.

The third Process is of the *Intrals*; whose generation is discovered in the Chicken, after the delineation of the body; (namely about the sixth or seventh day) and neer upon the same time, they all appear, that is, the *Liver, Lungs, Kidnies*, the *Cone* of the *Heart* and its *ventricles*, and also the *Guts*. But their first original is from the *Veines*, and are bred growing to them, (like *Wens* to the barke of *Trees*) and at first they appear *white, bloodless*, and like a gelly; and so continue till they are ripe for publick employment. The *Guts* with the *Stomack* seem at first like white threads, waved or contorted, extended through the longitude of the *belly*: and together with them the *Fabrick* of the *Mouth* is discovered; from which to the *Fundament* in a continued proceßion, the top

is united and linked to the bottom: the *Genitals* also are about this time visible.

Yet hitherto the *Bowels* and *Guts* are not shut up within the hollow of the body, but being fastned as it were to the *Veines* hang forth: and thus doth even the *Heart* himself. For the *trunk* of the body hitherto resembles a *Skiff* without a *deck*, or a *House* without a *roof*; as being hitherto no way covered over by the *anteriour parts*; namely, the *Breast*, and *Abdomen*.

But so soon as the *Sternum*, or *breast-bone* is framed, the *Heart* enters into the *breast*, as into a habitation of his own setting up, and furnished purposely for him; and being now retired, like the *Genius* of the place, he undertakes the patronage of the whole *Mansion*; and there dwells, with his servants the *Lungs*. After this, the *Heart* and *Stomack* retreat too; & at last the *Guts* shrowd themselves in the *Belly*. So that in a *Hen-egge* after the tenth day of *Incubation*, the *Heart* admits no spectators without dissection.

About this time the top of the *Bill*, and the *Claws* break forth, being all exceeding white; and now a *chylous* matter is visible in the *Stomack*, and a kind of *Excrement* in the *Guts*; and the *Liver* being now begun hath the *Gall*, which appears green adjoined to it. By which it appears, that a different *Concoction*, and *Preparation* of the *Aliment* is now made, (whereof these are the *Excrements*, from that which is performed by the *Propagations* of the *Umbilical Vessels*: so that a just doubt may hence arise, how *Choler* (the *Excrement* of the *Second Concoction*) can be separated from the rest of the *Humours* by the *Livers* help, when it is it self in being at the same time with the *Liver*.

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The Interiour parts are Universally generated, after the Order proposed: for in all Animals (which I ever dissected) they are framed after the same Manner, and Order: and especially in the more perfect, in Four-footed Beasts, and so in Man himself; In whom the Heart, Liver, Lungs, Spleen, and Guts, appear framed, and augmented in the Second, Third, and Fourth Moneths, at which times they are white, as also the whole Body. And hereupon the *first days* are not improperly called in *lacte dies*, the Dayes in the Milk; for the Bowels, and all the other parts appear *spermatical*, except onely the *Veines*, and chiefly those of the *Navel*.

The *Umbilical Arteries* are, I conceive, framed after their Name-sakes, the *Veines*; because they are scarce to be found in the *first moneths*, and take their Original from the Branches which descend to the *Thighes*: And therefore, I conceive, they are not constituted before that part of the *body*, (from whence they are derived.) But the *Umbilical Veines* are conspicuous long before any part of the Body is in hand.

What I have now delivered, hath been ratified out of many *dissections* of humane *Embryo's* of (almost) all sizes: for I have observed them from the bigness of a *Tad-pole*, till they became of the longitude of *seven or eight fingers* breadth, and so upwards to the Birth. And especially in the *second, third, and fourth moneths*; at which times the greatest Alterations befall them, and the progress of Generation is most evident.

Therefore, in a humane *Embryo* of *two moneths* old, those very things which we have related in the *second Process*, do appear begun. For in the *first moneth* I conceive there is *little or nothing* of the *fetus*

fetus extant in the womb ; at least I never found any thing. But that moneth expiring, I have frequently seen a conception cast out (like to that which *Hippocrates* relates to have fallen from the Minstrell) of the bigness of a *Pheasants*, or *Pigeons* egge, and it was of an *Oval* figure, just like an Egg with the *Shell* pilled off; but the thicker membrane (called *Chorion*) encompassing it, was plaistered on the out side, as it were, with a *mucous substance*, (especially in the *obtuser end*) but within it was slippery, being full of clear and stiff water, containing nothing else at all.

In the *second moneth*, I have often seen such a kinde of Egg (but larger) ejected upon indications of *Abortment*, namely the *Lochia ichorosa*; and it hath been sometimes *entire*, and sometimes *broken*, covered over with clotted blood. Within, it was smooth and slippery, the blood adhering without, and its form was like the other. In some of these ejections I have found a *fetus*, in other, none. That *fetus* hath been of the length of the nail of the little finger, but the shape was like a little frog, save onely that the head was great, and the legs extremely short: just like the *Tadpoles* in June, which when their limbs begin to shoot out, they loose their tail, and put on the shape of *Frogs*. All its substance was white, and so soft and gellyish, that unless it were cast into clear water, you could not hold it in your hand. The face was like that of other *Animals*, as of a *Dog*, or *Cat*, without lips, and a wide mouth from one eare to the other.

Divers Women, whose Conception (like an addle Egge) is fruitless, and without a *Fetus*, do suffer abortion the third moneth. I have often dissected an abortion of that age (being of the bigness of a Goose-egg) wherein was a *fetus*, distinct in all its parts,

parts; though their form was rough, and unshapen, The Head, Eyes, and Limbs appeared, but the *Muscles* were confused: having no *bones*, but in their places, certain *Lineaments*, and softer *Gristles*, as it were; the substance of the Heart was most white, having two *Ventricles* of equal magnitude and thicknesse, and a double *Cone*, like two small *Twin-kernels* of a *Nut*; the *Liver* was wondrous litle, and also white. All this time, namely, for three moneths space *Vix quicquam Placenta, five hepatis Uterini*, scarce any thing of the *After-burden* is to be seen.

In all these kinde of *Conceptions* (as many as I have seen) I still found the *ambient membran* fraught with a vast quantity of *watry substance*: in which the floating *Embryo* is so exceeding small, compared with the *place* where his abode is, and hath withall so long and winding a *Navel*; that those *waters* ought not upon any tearms to be thought the *sweat*, or *Urine* of the *Embryo*; but more probably, his *nutriment*, provided by nature (like the *Colliquamentum* in the *Egge*.) For I could finde no indication to induce me to believe, that that *conception*, or *Egge* had any connexion to the *Womb*: onely the outward *superficies* of the *obtus* end, looked something more wrinckled and thick; like the first intention of a future *placenta*.

Moreover those *Conceptions* appeared to mee, like certain *egges*, which were onely to be harboured within the *Womb*, but to be nourished (like the *Henne-egge*) by their owne *projection*, or *industry*.

Now in the *fourth moneth*, you would admire how much the *Fetus* is improved; for by this, he is encreased from a *Thumb-length* to a *Span*: and
all

all his members appear *distinct*, and have a tincture of *Blood*; the *Muscles* of the *Limbs*, and the *Bones* are now apparent; and also the *Rudiments* of the *Nails*; and the *Embryo* begins to bestirre himself soundly. Yet the *Head* is still very bigge; and the *Face* without *Lips*, *Cheeks*, or *Nose*: the chasm of the *Mouth* is very large, whose space is half supplied by the *Tongue*; the *Eyes* small, and without *Lids*; the middle part of the *Fore-head*, and all the upper-part of the *Head* is covered with a *Membrane*, which is not as yet *cartilaginous*, so far is it from being *Boney*: but the hinder part of the *Head* is something hard, and *Cartilaginous*, implying that the *Skull* beginnes to grow solid.

The *Genitals* likewise did appear, but the *Testicles* were seated within the *Abdomen* (where in females the *Uterus* resideth) the *Scrotum* remaining empty. The *Feminine parts* were imperfect, and the *Uterus* with its litle *Tubuli*, did represent *formam bicornem*, the two horned shape of the *Uterus* of a *Lamb*.

And now the *Placenta* was enlarged, and affixed to the *Womb*; comprehending almost halfe the *Conception*; appearing to my eye like a *Tumor*, or fleshey excrescence of the *Womb*: its *Gibbous* part did stick so fast, even throughout its whole extent, to the *Womb*, which was now grown thicker. Into this *Placenta* the litle *Umbilical branches* (like slender rootes into the *Earth*) did insinuate themselves: and by its mediation the *Conception* was now first tyed to the *Womb*.

The large and fluid *Braine* resembled *Cheese-Curd*, and was embrodered with larger *Veines*. The two *Ventricles* of the *Heart*, both of the same magnitude, and their walls equally thick. In the

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Region of the *Breast* within the *Ribs*, I saw three hollow places, and those not much unlike each other: the lowest of which, the *Lungs* having *Blood* in them, and of like complexion with the *Liver* and *Kidnies*, did inhabit: the middle was possessed by the *Heart* and *Pericardium*: but the upper was filled with that large *Glandule* which we call *Thymus*, the *Sweet-Bread*.

In the *Stomack* was *Chyle*, of like substance to that in which the *Embryo* swims: There was also a coagulated substance which was white, like to those white curded pollutions which the *Midwife* washeth off from the *Infant* (especially from the foulds of the *Skin*) so soon as it is borne. In the superiour *Intestines* was *Excrement*, or some part of the *Chyle*, in the inferiour a litle dark excrement. In the *Bladder* was *Urine* found: and *Gall* in the *Vesicle* designed for its reception. *Intestinum Cecum*, the *blind Gut* (just as it is in grown persons) like an empty superfluous appendix of the *Colon*; and nothing like what it is in other *Animals*, (as the *Hogge*, the *Horse*, and the *Hare*) in which it is like a *Second Stomack*. The *Omentum*, or *Kell*, did like a *Caule*, or thin transparent cloud, lye floating upon the *Guts*.

The *Reines* at this time are not formed into a gibbous figure, as it is when men are grown, but are moulded of several gobbets (as you see in a *Calf*, and in a *Sturgeon*) as if to every sprig or divarication of the *Ureters*, there were a gobbet or Teat, out of which their *Orifices* did draine the *Urine*. Upon the *Kidnies* there are the two *Glandules* (which *Eustachius* first found out) wherein store of blood lies; and their *Vein*, which *Anatomist* call *Adipose*, seems not much less then the *Emulgent* it self. The *Liver*, and *Spleen*, are equally full of blood (ac-

cording

according to their several proportions.)

And here we must observe by the way, that in every *Humane Fetus* that is lively and well, perfect Milk is found; wherewith chiefly the *Glandule Thymus*, or the *Sweet-bread* is stored. It is also found in the *Pancreas*, and almost all along the *Mesentery*, in certain *Vene Lacteæ* as it were, and the *Glandules* placed between the *divarications* of the *Meseraicke Veins*. Nay sometimes it may be milked out at the *breasts* of *New-borne Infants*, and sometimes also it starts out of it self: which some *Midwives* say, doth make for the *Infants Health*.

And that it may plainly appear, that the water (which is so plenteous in the *Conception*) is no excrement discharged by the *Embryo*, as either his *Sweat*, or *Urine*; it is lesse (in proportion) neer the birth (when the *fetus* is now more grown, and upon that account doth accumulate more excrement, because he requires more nourishment) then in the *first moneths* of *pregnation*. And moreover, at that time his *bladder* is full, and distended with *Urine*. And to say truth, that passage, (which *Anatomists* call the *Urachus*) which should (as they phansie) convey the *Urine* from the *bladder*, through the *Navel*, could never yet be found out: but I have often seen the *bladder*, pressed or griped with the hand, discharge the *Urine* out at the *Yard*, but never at the *Urachus*.

And let this suffice, concerning what we have observed in a *humane Fetus*, so farre forth as it relates to the knowledge of the Order of the Parts.

In the Fourth and last Process, the parts of meaner rank and condition are formed: such as do not simply relate to the very being, and preservation of the Animal, but onely *ad tutelam*, to

its safe-guard against forreign injuries : or *adornatum, vel pugnam*, to its Ornament, or for Defence.

For that kind of *Safe-guard* or *Defence*, the utmost part (namely the *Skin*) is chiefly constituted, and all that proceeds out of it, as the *Scarfskin*, the *Haire*, *Wool*, *Plumes*, *Scales*, *Shells*, *Claws*, *Hoofs*, and the like. And indeed it is a prudent contrivance of *Nature* (who never makes any thing indiscreetly,) to beget those parts last of all, whereof she hath no use till after nativity. And therefore the *Chicken* is borne with down only on him, and not Feathers (as other *Birds* are, who are presently fitted for *flight*) because by wandring to and fro, he earns his sustenance with the industry of his *Legs*, rather than his *Wings* : And so again young *Ducklins*, and *Goslings*, who prey in the water, have their *Plumes*, and *Wings* later perfected than their *Legs* : which is clean contrary in young *Swallows*, which, because they are to fly about to glean up a living, are sooner versed in flight, than walking.

Now the *Down* starts up in the *Chicken* after the Fourteenth day, when the *Fetus* is now compleat, and provided with all his parts. But in many of them, at their first nativity, it looks like *dark spots* or *points* ; and after that the *Feathers* sprout up like *Grasse* in the *Field*, and at last ex-patiate, and cloath the body round, protecting it from the inclemency of the *Aire*.

The *Feathers* differ from *Quills*, in form, use, and place of Production. For *Chickens* are Feathered ere they have *Quills* : for *Quills* spring only in their *Wings*, and *Rump* ; and stick deeper in the bottome of the flesh, or the very *Periostium* is self, and are useful to *motion* : but the *Feathers*

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Ex.LVI. according to Experience.

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rise out of the superficies of the *Skin*, and serve for protection.

Nails, Hair, Hornes, and the like, saith Aristo- De gen.an.
le, are bred out of the Flesh, in so much that they l. 2. c. 4.
change colour with the Flesh: for the white, and black,
and diverse coloured, are made so, according to the
different complexion of the Skin. But in our Chicken,
all this is clean otherwise, for what various co-
lour soever the Feathers be of, the Skin beneath
them is of one onely. And many times one and
the same Feather is diversly painted and disco-
loured, for the pomp and beauty of the Fowle.

Likewise in the *Humane Fœtus*, the *Cutis* and all the *skinny parts* are last perfected. And therefore at the beginning, there are neither *Lips*, nor *Cheeks*, nor *Ears*, nor *Eye-lids*, nor *Nose* to be seen: and that line wherby the *upper-lip* is united into one, doth close the last of all.

The *Humane producion* is also borne *naked* and *unarmed*; as one whom *Nature* had intended for a *sociable, political, and a peaceable creature*: and to be ruled more by *reason*, then constrained by *force*. And therefore she hath furnished him with *Hands*, and *Understanding*, that having provided *properties*, he might *cloath*, and *defend* himself. For those *Animals* whom *Nature* hath made strong, she hath also armed with *weapons* agreeable to their strength: but where she hath denied strength, she hath bestowed *wit*, and *cunning*, and an admirable dexterity to evade affronts.

The *Ornaments*, as the *Tuft* upon the *Head*, the *Comb*, the *Gills* and the like, wherewith the haughty *Animals* swagger, are for the most part imparted to the *male*, more then the *female*: as also all *weapons* too, as *Teeth*, *Hornes*, and *Spurs*, &c. which appoints them for the *Battail*. And they are then

completest in the *male*, about that time when the *female* is in her prime, and provoked to leave an *Heir* behind her. For they are yet to come in the *younger Animals*, and in the *aged* they wither, and decline (as uselesse.)

Our *Dunghil-Cock* (that famous Champion) so soon as he is strong, and ripe for generation, is provided of his *Spurs*, *Comb*, and *Plumes*; by which he becomes amiable in the sight of his *Concubines*: and combats other *Cocks* not from any vaine Itch of *Ostentation*, but to perpetuate his own *Linage*, that so he that is best able to protect himself and his *Charge*, may have the prerogative to propagate the *Species*. For all those *Animals* which are well appointed with armes, and more *Martial* creatures then the rest, do ground their quarrels, either upon the *Rescue* of their *Young*, or their title to their *habitations*, or their husbandry for their *provisions*, but in chief, upon *Rivalship* in their Loves (and that, for posterities sake) and being subdued, as they lay by their *pomp*, and disdainful demeanour, so they surrender their claim to their *Wives*; and with dejected spirits languish out their days; while the *Victor* fished with the conquest, riots in the enjoyment of the *Captives Female*.

Nor is this their bravery any ascititious *Wardrobe*, or some few daies Pageantry, or Masquing-stuff, but a lasting one, and Natures liberal Dowry, which delights not onely in the Embroidery of *Animals* (and chiefly of *Birds*) but hath imployed her Pencil upon *Flowers*, and *Plants*, adorning them with wonderful *Art* and variety of colours.

*Certain Paradoxes, and Problemes
to be considered of, concerning
this Subject.*

EXECUT. LVII.

Thus far have we spoken concerning the *Order of Generation*: by which the difference between those creatures which are produced by a *Metamorphosis*, and those which are borne by an *Epigenesis*, hath been discovered: as also, between those that spring from a *Worme*, and those that arise from an *Egge*: for these are bodied out of one part of the prepared matter, and fed with the other; But they take up the whole matter in their frame, or *Constitution*: these are together augmented and formed; they are *augmented* first, and from a *Canker-Worme* grow into an *Aurelia*, and are afterwards formed and made consummate *Animals*, as *Butterflies*, *Silk-wormes*, and such like *Animals*.

And therefore *Aristotle* (as *Fabricius* observes) as he constitutes a kind of twofold nature of the *egge*, and a kind of twofold *Egge* in these creatures; so he laies down a twofold action, and a twofold *Animal* produced by it. For (saith he) out of the first *egges*, which are the first rudiments of the *Generation*, a *Worm* constantly doth proceed: namely, out of the *Egges* of *Flies*, *Ants*, *Bees*, *Silk-wormes*, &c. in which a certain fluid matter is contained, and out of all that fluid matter is the *Worme* made. But out of the second *Egges*, which are layed by the *Worm* himselfe, the *Butterflie* is born, and proceeds; that is, a *Vo-*

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latile Animal, which is concluded in a kind of Shell, Skin, little bag, or egge, and when that bag is broken it departs thence, as Aristotle delivereth concerning the Locusts egges. Lastly these are perfected by a succession of parts; but they (namely, such as are generated by a Metamorphosis) are made intire at once. And in the same manner, are both Spontaneous productions generated, which obtain their first matter, and first extraction from putrefaction, filth, dew, excrements, or out of the parts of Plants, or Animals; as also those issues which proceed from the seed of Univocal Animals. For it is common to all Animals, to desume their Original from seed, or an egge: whether that seed proceed from other Animals of the same species, or happen there casuall from some thing else. For as it sometimes befalls in Art, so also in Nature; namely, that the same things are sometimes casuall, which at other times are effected by Art: as Aristotle doth instance in Health, so in like manner is the Generation of any Animals; (as far as they proceed from Seed) whether their seed be casuall, or else proceed from an Univocal Agent of the same kind. For even in casuall seed, there is a motive principle of Generation, which can generate out of it self, and by it self: and the same thing is found in it, as in Univocal Animals; namely, a power to form a living creature. But of this more at large hereafter,

Now some Paradoxes do here arise to be examined. For since the *Macula* is dilated, the *Colligamentum* concocted, and prepared, and many other things (not without great providence) ordered, towards the formation, and growth of the *Chicken*, before any particle of the *Chicken* appear; what should hinder the *Innate* beat, and *vegetative* soul

soul of the *Chicken* to be existent before the *Chicken* it self? For what can produce the effects and operations of *Life*, but that which is the *cause* and *efficient* of those *Effects* and *Operations*; namely, the *beat*, and *faculty* of the *Vegetal* soul? And therefore the soul doth not seem to be *Actus corporis Organici vitam habentis in potentiâ*, the *Act* of an *Organical* body, which hath *Life* in it *in potentiâ*: for we conceive the *form* of the *Chicken* to be such an *Act*. Now in what can we imagine the *form*, or *soul* of the *Chicken* to be, but in the *Chicken* it self? unless we allow the *forms* to be separate, or grant a *Metempsychôsis*.

But this is most manifest, where the same *Animal* lives by a succession of forms; (as *Aristotle* speaks) as for example, Out of a *Canker-worm*, an *Aurelia*, and then a *Butterfly*. For the same *Efficient*, *Nutritive*, and *Preserving* principle, must needs be in each of these: unless we will place one soul in the *Boy*, another in the *Young man*, and a third in the *Old*: or affirm, that the *Canker-worm*, and that worm which becomes a *Silk-worm*, also the *Silk-worm*, and the *Butterfly*, have the same form, of which matter *Aristotle* hath accurately written, and whereof more largely hereafter.

Again, it seems a *Paradox*, that the *blood* should be made, and move, and be endowed with *Vital* spirits, before any sanguifying, or *Motive* *Organs* are constituted at all.

Nor is it less new and unheard of, that there should be *Sense* and *Motion* in the *Fœtus*, before his brain is made; for the *Fœtus* moves, contracts, and extends himself, when there is nothing yet appears for a *brain*, but clear *water*.

Besides, the *body* is nourished and encreased, before the *Organs* dedicated to *Concoction* (namely the

the *Stomack* and *Liver*) are formed. And likewise *Sanguification* (which is the second *Concoction*) is performed before the first, (which is by the *Stomack*) and called *Chylification*.

The *Excrements* of the first and second *Concoction* (namely in the *Guts*, and the two *bladders*, of *Urine* one, the other of *Gall*) are coetaneous to the *concocting Instruments* themselves. Lastly, there is a *Minde*, *Providence*, and *Understanding*, not onely in the *Vegetal part* of the *soul*, but even before the *soul* it self; procuring, disposing, and ordering all things, and artificially molding the future *fetus* to a resemblance with his parents, even from the very first *original*; and all this, to advance the being, and well being of the *Fetus*.

Concerning which *Resemblance*, we may enquire, what should be the cause why the *Fetus* sometimes resembles the *Father*, sometimes the *Mother*, and sometimes also the *Progenitors*, and those ei her of the *Father* or *Mothers* side? And this the rather, since upon one single *coition*, and at the same moment of time, many *Egges* are fructified together. This also is a wonderful thing, that the *Virtues*, and *Vices*, the *Diseases*, the *Marks*, the *Moles* or *Spots* should be transferred to *Posterity*: and that into some onely of the *Progeny*, and not unto all. In the race of *Cocks*, some are of a generous *spirit*, and born to *battle*; who will dye rather then turn their backs upon their *Advertaries*: and yet their *Nephews*, unless they proceed of like parents, do by degrees forfeit their *galantry*; according to that saying, *Fortes creantur fortibus*. In many other *Animals* (and especially in *Man*) the *Bravery* of the *Succession*, or *Family* is observable: and many of the *Indowments* both of *body* and *soul* are derived down to it *ex traduce*.

This

This I have often admired, that when the Issue hath obtained a mixt *fabrick* or composition from both Parents, and that in all other parts of the body, yet it hath not been so in the *Genitals*; but that it commonly proves either *Male*, or *Female*, and very seldom an *Hermaphrodite*.

Lastly, many things are in the *fatus* ere they appear at all; and some things are begun with the first, but perfected with the last: as the *Eyes*, *Genitals*, and *Bill*.

And hence there arise debates concerning the pre-eminence, or dignity of the *Parts*; in which the Wits of such as are curious in these cases, may employ themselves. As, Whether the *Heart* bestow life and vigour upon the *blood*, or the *blood* rather upon the *Heart*? Whether the *blood* be made for the *bodyes* sake, as the *Matter*, *Nutrimment*, and *Instrument*; or else the *body*, and all its parts for the *blood*, and the *soul* which doth first and principally reside in it? Likewise, Whether the *Ventricles*, or *Auricles* of the *Heart* are most honourable? For we finde that the *Auricles* have life and pulse first, and do expire last. And farther, Whether the *left Ventricle* of the *Heart*, which is deeper in a *Man*, and is fenced with a thicker and more carnous wall, and is conceived to be the *fountain* of the *Spirits*, be the more excellent, hotter, more fraught with *Spirits*, and *livelyer* of the two: or the *Right*, which doth last languish and subscribe to Death, containing a large quantity of *blood*: and where the Dying mans *blood* doth last congeal, and is deprived of life and spirit? and whether also the *Umbilical Vessels* do transport the *blood* (as to their fountain) and whence also they derive their extraction?

Now these things do result out of the *Observation*

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tion of the Order of the Generation of the Parts, as also other things which may be hence deduced, and do not a litle clash against the *Physiology* commonly approved. Namely, (when we plainly see that there is both *Sense & Motion*, before the *brain* is begotten) it is evident that all *Sense* and *Motion* is not derived from the *brain*: for it appears by our *History*, that *Sense* and *Motion* do clearly discover themselves in the *first small drop of blood* in the *Egge*, before any *particle* of the *body* is framed. And likewise, the first platform or constitution (which we call *gelly*) is laid before any part is discerned; and when the *brain* is now nothing but a clear water: which first rudiment of the *Body*, if it be lightly pricked, will, like a *Worm* or *Magot*, obscurely move, and contract it self: which is a plain testimony of its *sense*.

There are also other Arguments deduced from *Sense* and *Motion*, by which we may conclude (with *Aristotle*) That the *Heart*, and not (with *Physitians*) that the *Brain* is the first Principle.

Those *Motions* and *Actions*, which *Physitians* call *Natural*, because they proceed whether we will or no; and we cannot moderate, accelerate, retard, or refrain them at our own pleasure: & which therefore are Independent in regard of the *brain*; yet even they are not performed without all *sense*, but do imply *sense*, as by which they are excited, provoked, and altered. For we conceive, that in the *Heart* it self, its *Palpitation*, *Trembling*, *Fainting*, *Sowning*, and all the changes in the *pulse*, either in *magnitude*, *celerity*, *order*, *rhythme*, or the like, do proceed from *morbifical causes* indisposing it, and offensive to its *sense*. For whatsoever by diversity of *motions* makes warre against those things that enrage and molest it, must needs be indowed with *sense*.
The

The *Stomack* and *Guts* provoked by injurious humours, do raise a *Nauseating*, *Belching*, *Rumbling*, *Vomiting*, and *Flux*; and as it is beyond our power, either to raise or lay these combustions, so are we to seek for any such *sense* retaining to the *brain*, which should excite those parts to such *Expressions*.

It is very strange, that upon the *Infusion* of *Antimony* taken in a *Vomit*, though we neither distinguish it by taste, nor finde any disgust in it, either swallowing it down, or in returning it back again; yet there passeth a censure upon it by the *Stomack*, which discerns between what is usefull and prejudicial, and so provokes to *Vomit*.

Nay, the *Flesh* it self doth easily distinguish a *poisonous wound* from one that is not *poisonous*; and thereupon contracts it self, and condenseth; upon which enflamed *tumours* arise: as we may see in the stings of the *Bee*, the *Gnat*, and the *Spider*.

I my selfe once, for experiment sake, pricked my *band* with a *needle*; and presently rubbing the same needle upon a *Spiders tooth*, I pricked my *band* in another place, so that I my self could not distinguish between the two pricks. But there was something in my *Skin* that did distinguish; for in that place where the *poisoned* prick fell, it presently contracted it self into a *pimple*, and presently grew red, hot, and inflamed; as if it fortified it self, and stood upon its *guard*, to oppose, and subdue the malice of the *Venom*.

The Offences undergone by the *Matrix*, as its *Contorsion*, *Descension*, *Falling down*, *Rising*, *Suffocation*, and other *Maladies* and *Provocations*, do no whit depend upon the *Brain*, or *Common sense*; nor yet can they be conceived to befall it insensibly. For that which is plainly void of *Sense*, cannot
seem

seem any way to be provoked, or heightened into any motion, or action. Nor have we any other signs to distinguish an *animate* and *sensitive* creature, from a *dead* and *senseless* one, then by its *motion* provoked from some offensive object, which doth always follow, and argue *Sense*.

But of this more at large, when we treat of the *Actions* and *Use* of the *Brain*. But the Reverence due to the *Antients*, and *Antiquity* her self, doth advise us to uphold their *doctrines*, so farre as they are *true*. Nor can it beseem us rashly to reject, and discountenance their *Labours*, and *Decrees*, whose light hath been our direction to the Shrines of *Philosophy*; wherefore I conceive we ought to think thus. We perceive we have *Five Senses*, by which we give judgement upon outward things; but because it is not the same *sense*, by which we perceive, and by which we perceive our own *perception*; (for we see with our *Eyes*, but we do not by them *know* we see) but by another *sense*, which employes another *sensitive Organ* (namely, the *Internal Common sense*) by which we give judgement upon all those things which we perceive by our *external Organs*, and so distinguish *white* from *sweet*, and *hard*: This common *Sensorium*, or *Organ of Sense* (whither all *Species* are conveyed from the outward *Organs*) is plainly the *Head*; which, together with all his *Nerves*, and outward *Organs* adjoined to them, is understood to be the adequate *Organ of Sensation*. And it is like the *Sensitive Root*, from which several *Fibers* result; whereof one *sees*, another *hears*, a third *toucheth*, and the other *smell*, and *taste*.

Yet as there are certain *Actions* and *Motions*, whose *Regiment* or *Jurisdiction* relates not to the *Brain*, and they therefore are called *Natural* &

so also must we conclude, that there is a certain *sense of Touching*, which is not conveyed to the *Common sense*, or any way communicated to the *brain*; and therefore in that kinde of *sense*, we do not perceive our *sensation*: but just like *men* whose *understanding* is *perverted*, or else are distracted by some violent *Passion*, insomuch that they are insensible of all *pain*, and takes no notice of any thing that meets their *senses*: So we must conceive it to be in this *sense*, which we therefore distinguish from *Animal sense*. Having observed such a kinde of *sense* in the *Zoophyta*, or *Plant-Animals* (as the *Sensitive plant*, *Sponges*, and the like.)

Wherefore, as many *Animals* have both *Sense* and *Motion*, without the *Common sense*, or a *brain*; as the *Worms* in the *Guts*, also those *Worms* which turn into *Silk-worms*, and the like, so also do some actions befall the *Embryo*, and us also without any assistance from the *brain*, and a kinde of *sensation* doth proceed, without *sense*. And as *Physitians* teach, that *Natural Actions* differ from *Animal*; so upon like reason, the *Natural Touch* seems to differ from the *Animal sense of Touching*, and constitute a distinct species of *Feeling*: so that the one is communicated to the *Common sense*, or *brain*, and the other not.

Moreover, it is one thing for a *Muscle* to be moved or contracted, and another thing for it to perform an *Action*, at distinct regulated contractions and relaxations; as to go forward, or receive any thing in the *hands*. Doubtless, the *Muscles*, or *Motory Organs*, in the *Cynical distortion*, or *Convulsion* proceeding from some cause that disturbs them, are no otherwise moved, then a *Cock* or *Hen*, which when the *Head* is quite chopped off, is disturbed with many convulsive motions of the *Leggs* and *Wings*: but
such

such as are altogether confused, and disordered, because the sway of the *brain* is dethroned, and the *common sense* deposed, under whose *Government* formerly, those motions were regulated by *rhythm* and *harmony*, either to *walking*, or *flight*.

We conceive therefore, that it ought to be said, That all *Natural Motions* proceed from the power of the *Heart*, and are as his *Retinue*: but the *Spontaneous*, and such as perfect any *Action*, (which *Physitians* call *animal*) are not produced but by the *brain* and *common sense* controuling them. For as by this *common sense*, we perceive our own *Sensation*, so also we perceive our own *motion*; and that whether it be regular, or perverse.

We have a clear Instance of both these motions in *Respiration*; for the *Lungs* (as the *Heart*) are continually moved up and down by a *natural motion*, and also provoked to cough, and frequent *Agitation*; but produce or shape a *voice*, or sing they cannot, without help, and commission from *common sense*.

But these things are to be more fully handled, when we shall fix our contemplation upon the *Action* and *Use* of the *Brain*, and the Consideration of the *Soul*. But thus much hath been delivered by the way, that we may declare, our desire and inclination to pay our *Masters* the respect we owe them.

Of the Nutrition of the Chicken in the Egge.

EXERCIT. LVIII.

HOW much the *Authority* of the *Ancients* is not rashly to be rejected, appears even in this : It was of old an opinion much prized (which yet many at this day disclame as erroneous; and *Fabricius* decryes it as a meer delusion, and fond persuasion) that the *Embryo* did suck, in its mothers *Womb* : and it had *Democritus*, *Epicurus*, and *Hippocrates* himself for its *Abettors*. And *Hippocrates* doth establish his opinion chiefly upon two arguments; For, saith he, unless it had sucked, how could it deposit any excrements : or know how to suck so soon as it is born.

De form. fet. p. 19. or 134. l. de carn. & de nat. puer.

Now in other cases they use to subscribe to every word pronounced by this so famous, and ancient *Oracle*, and his *αὐτὸς ἴππ* was warrant enough : but here (because he delivers things dissonant to what is commonly received, *Fabricius* doth not only renounce his bare assertion, but stands out in defiance against his proofes. Therefore I appeal to the judgement of the most skilful *Anatomists*, and most learned *Physitians*, whether our *Observations* concerning the *Generation* of *Animals*, do not onely cast a probability, but inforce the necessity of this opinion of *Hippocrates*.

All in general acknowledge, that the *Fetus* while he abides in the *Womb* doth wallow in abundance of *Water*, (which *Liquor*, we, in the *History* of the *Egge*, stile the *Colliquamentum*, and the

A a Moderns

Moderns say that *Water* is the *Sweat* and *Urine* of the *Fetus*; affording this advantage, that the *Fetus* floating in it (while the *Mother* runs, leaps, or uses any other violent motion) doth not easily offend the *Womb*, nor is himself wronged by allision against the *bones* seated there round about him, or some outward blowes; and the rather, for that at this time, his *body* is but tender, and infirme.

pag. 137.

Fabricius adjoines other benefits arising from these *Waters*; namely, Their moistning and lubrifying all the passages round about, and rendering the neck of the *Matrix* capable of the largest dilatation; and all these commodities, saith he, do no less arise from that thick white *Excrement*, answerable to that of the third concoction, which is *Unctuous*, *Oily*, and *Fat*, and neglected by the *Ancients*. Which it also performeth, least the *Sweat* which may sometimes transpire, sharp, and saltish, should erode the tender *Infants* body.

I willingly acknowledge the several benefits assigned to this water, by all Writers; namely, that the tender *Fetus* in order to his indemnity from any suddain, and violent motions of his *Mother*, is thus securely nestled in *alis vestertilionum*, in the *Bats* *Wings*, as they call them, and moated round with store of water, so that he cannot easily, by every (though violent) motion dash himselfe against his *Mothers* sides; (because of those ties which fasten him on every side) at least this circumambient liquor being equally poised in the midst doth protect him from all outward harme. But my own Observations, as they do in many other matters, so also in this enforce me to be of a contrary opinion to *Fabricius*: for I am most certain, that the said liquor, is not the *Sweat* of the

the *Fetus*. Nor can I believe, that that *water* doth perform those offices in the *birth*, which he commemorates : and much lesse, that it is so sharp and *Briney*, that the *fetus* must stand in need of an oily unctuous fence to secure him from it, especially that *fetus*, which is either cloathed with *Wool, Hair, or Feathers*. For this *liquor* is of a good favour, and like a kind of watry Milk ; and therefore, almost all *Viviparous Animals*, so soon as they have brought their *Young* into the world, fall aboard and eat it up, and lick their new born *issues* clean, greedily swallowing the humour which they receive in, when they will not so much as touch the *excrements* of their *fetus*.

Fabricius conceived this *water* to be *sharp*, and *salt*, because he thought it to be the *sweat*. But what injury, I pray, can the *sweat* do to the *fetus* now cloathed in *feathers*? if at least he ever saw such a creature as a *sweating Chicken*.

And I suppose he will not say, that the use of that *water* in an *egge*, is by its *moisture* and *lubricity* to expedite the *Chickens birth*. For the dryer and older the *shell* is, by so much the *frailer*, and *brittler* it becomes. Lastly, were it the *Chickens sweat*, it would most abound neer the *Exclusion* ; for the larger the *Chicken* is, and the more *Aliment* he takes in, so much the more *sweat* must he necessarily create. But a litle before his *Exclusion* (about the *nineteenth* or *twentieth day*) there is none of this kind of *humour* discernable ; whereby, he should have rather reputed it an *Aliment*, then an *Excrement* : (had he rightly considered the matter) especially, seeing he allows the *Chicken* in the *Egge*, the use of *Respiration*, *Voice*, and *Crying*, which, were he begirt with *water*, could not have been.

Nor are these *Waters* of any great use, to the Expedition, or Lubricity of the *Delivery* (as experienced *Midwives* know full well) though *Fabricius* would have it otherwise. For the neighbour *Parts* are about that time, (without any profusion of those *Waters*, mellow and relaxed by a certain maturity of their owne: especially, those which may be an obstruction to the work: namely, the *Ossa pubis*, & *Coccygis*; about which the chiefeft care of the *Midwife* is exercised in furthering the *delivery*: for she is less solicitous, to anoint the fleshey parts, least they rend in sunder, then in putting back the *Coccyx*; which if she cannot effect with her own hand, she calls in the *Man-Midwife* to procure her purpose by the *Speculum matricis*; which instrument by its triple sides, whereof one is applyed to the *Coccyx*, the other two to the *Ossa pubis*, doth distend those parts by force.

For the *Infant* now just at his Birth, while hee turnes himself, and precipitates his *Head* downward, doth relax and open the orifice of the *Womb*: but if in his descent he light upon the top of the *Bone*, there he sticks; and hardly gets forth, and that not without danger, to himself, and his Mother too. Now it is evidently natures intent, to mollifie and relax those parts. For, if the *Midwife* do discover the *Orifice* of the *Matrix* become soft and loose, she laies it down for an infallible sign of the approaching *delivery*, though the *Waters* are not yet broken. Nay (I speak what I know by *Experience*) in case any thing remaine after the *delivery*, which ought to be discharged, or if at any other time there be any thing in the *Womb*, which it indeavours to be rid of, the *Orifice* doth not onely descend, but is also soft and relax.

relaxed: but if after the *delivery*, that *Orifice* be retired into its place, and be perceived to be grown something hard, it is an evident sign that all is well.

And by the like *Experience*, I pronounce, the *Ossa pubis* to be often loosened one from another in *delivery*, their *cartilaginous* connexion being mollified, and all the *Region* of the *Lower Belly* miraculously dilated; and this not by the profusion of the *Watry substance*, but of their own accord, as ripe *fruits* use to revolt or open, to make room for the *Exclusion* of their *seeds*. But how much the *Coccyx* may retard the *delivery*, is clear in *four-footed beasts*, that have *Tailes*; for they can neither bring forth young, nor disload the *excrements* of the *Guts*, unless they remove their *Taile*; which if you depress with your *hand*, you hinder the passage of the *Excrement*.

Moreover, that is accounted the most *Natural Delivery*, when the *Fetus* and *Secundines* with the *Watry substance* (that is, the *Entire Egge*) get forth together. For if the *Secundines* be entire, and the *waters* not broken, the circumjacent *parts* are more distended, & dilated by the *Thromes*, namely, by the distention of the *Membranes*, whereupon, the *fetus* works his release with less struggling; though the *Mothers paines* be the greater. In which condition, we know how the *Woman in Labour* is much relieved from the intollerable torment caused by distention, upon the breaking of the *Membranes*, (whether it be done by *Midwives* nailes, or by a pair of *Scissors*) the *Waters* by that means being set a float.

And the skilful *Midwives* know very well, that in case all the *Waters* be come away, before the *natural opening* of the *Womb*, the *Woman with Child*, continueth the longer in *Labour*, and her *Travail*

is the harder ; which would yet be contrary, in case those precedent *Waters* (as *Fabricius* would have it) did so much conduce to the *mollifying*, and *Lubricity* of the parts.

Besides that this humour, which we call the *Colliquamentum*, is not the sweat of the *fetus*, is evident, both in the *Egge* and other *Animals*; for it is in being, before any part of the *fetus* is constituted, or any rudiment of him extant. Nay so soon as he is discernable, and is yet but gelly, and very small, so great a quantity of *Water* is to be seen, that it is utterly impossible, so inconsiderable a *bulk* should afford such plenty of *Excrement*.

Adde to this, that the *fibres* of the *Umbilical vessels* are scattered and terminated in the *membrane* containing this *Water*, as in the *Yolk* and *White* of the *Egge* : to give evidence clearly (if you consider the thing, as it truly is) that this humour, is rather to be conceived the *Aliment*, then the *Excrement*.

Wherefore *Hippocrates* his opinion seems to me more probable then that of *Fabricius*, and other *Anatomists*, who count this *Liquor* the *Sweat*, and *Prejudice* of the *fetus*. For I believe that this *Colliquamentum*, or *Water* wherein the *fetus* swims, doth serve for his sustenance; and that the thinner & purer part of it, being imbibed by the *Umbilical Vessels*, do constitute and supply the *primogenit parts* : and the rest, like *Milk*, being by *suction* conveyed into the *Stamack*, and there concocted or chylified, and afterwards attracted by the *Orifices* of the *Meseraick Veins*, doth nourish and enlarge the tender *Embryo*. And to fortifie my persuasion, I shall lay down some arguments, that prevaile with me.

So

So soon as the *fetus* attains any perfection, he presently stirres his *Limbs*, and proceeds to make tryal of those actions, to which his *Instruments of motion* are designed. Now we see the *Chicken* in the *Egge*, open his *mouth* amidst this *Water*; whereby he must needs swallow it down. For it is most certain, that whatsoever is gone beyond the roote of the *Tongue*, and is arrived at the top of the *Gullet*, no creature can return (but by *Vomition*) whereupon the *Farriers*, which administer medicinal *Potions*, *Boles*, or *Pills*, to *Cattel*, taking them by the *tongue* cast it in beyond the protuberance of the *Tongue*, just at the *Root*, that so they cannot avoid the swallowing. And if any of us, convey a *Pill* so far as the root of the *tongue*, he shall find himself necessitated to swallow it down, unless a *Vomit* meet, and repel it. Wherefore since the *Embryo* wallowing in the fore-said *liquor*, doth open his *mouth*; it follows likewise that it must enter in; and since he moves his other *muscles*, why should we doubt, but that he imployes the *Instrument* of his *throat* likewise, and so imbibes the *humour*.

Moreover it is certain, that in the *Craw* of the *Chicken* (and the like is also found in the *Stomack* of all *Embryo's*) there is seen a *substance* most like in *colour*, *tast*, and *consistence* to the said *liquor*; which being a while digested in the *Stomack*, resembles *coagulated Milk*; and we have also found it like to *Chyle*, in the *upper Gut*, the *lower Guts* being then stuf with *Excrements*.

So also in the *fetus* of *Viviparous creatures*, the thicker *Guts* are full of such an *Excrement* as that, wherewith they do abound all the while they are fed with *Milk*. Also in *Sheep* and other beasts which divide the *Hoof*, the dried dung is manifestly to be seen.

About the *seventeenth day*, I have evidently found *excrement* in a *Chicken*, neer the *fundament*, and have also seen it, when it hath been discharged into the *Secundines*, a little before the *exclusion*. And *Volcherus Goiter*, a diligent and skilful *Anatomist*, records the same observation. Why then should we scruple to say, that the *fatum* in the *Womb* doth *suck*; and that a *Chyle* is made there; when we have both the apparent *principle*, and *rejections* of it.

Besides, at that time when we see both the *bladders*, one full of *Gall*, and the other of *Urine* (both which are *excrements* of the *second concoction*) why may we not conclude that *Chylification*, which is the first *concoction*, went before it.

The *Embryo* therefore *sucks*, and receives *nutrition* in at the *Mouth*. And this you shall soon discover, if so soon as ever he is borne, you put your *finger* into his *mouth*. Which according to *Hippocrates*, would not be, had he not *sucked* before in the *Womb*. For we see young *Children* make *essays*, and attempt upon all performances: namely, moving their *Limbs*, *crawling* along, and endeavouring to *speak*: all which they attain at last with dexterity, by long practice, and education. But so soon as ever they are born, nay before they are born, they will *suck*. For we have found by experience, that while they yet stick fast in the *Birth*, before they can either *cry* or *break*, they will seize upon the *finger* extended to them, and suck it.

Nay, A *New-born Child* is more exact at *sucking*, than a grown *body*, or himself either if he discontinue it but a few days. For the *Infant* doth not compress the *Nipple*, and suck at the rate that we do by *gulping* down: but as if he would devour the

the Nipple, he still draws it into his *mouth*, and by the aid of his *tongue*, and *palate*, he sucks the milk, as if he chewed it; with farre more earnestness, and slight, then a *grown body*. Wherefore he seems to be good at it of old, and to have practised it in the *womb*; for we see how soon he unlearns it by discontinuance.

By these and other *Observations* it is probable, that the *Chicken* is fed two waies in the *Egge*; namely, both by the *Umbilical*, and the *Meseraick Veines*: by the former, he attracts well digested *aliment*, whereby the *Blood*, and *primogenit parts* are constituted, and encreased; by the other, *Chyle*, which conduces to the *fabrick*, and *augmentation* of the other *parts*.

Now, perhaps the reason may seem obscure; wherefore the same *Agent* should out of the same *Matter* proceed to a diverse manner of *Nutrition*: (when *Nature* doth nothing in vain) yet we will endeavour to discover the reason.

That *Part* which is attracted by the *Umbilical Veines*, is the purer and sincerer part: But the remaining *Colligamentum* wherein the *Fetus* floats, is a kind of crude *milk*, without cream, deprived of its purer part. The more *pure* part therefore stands in no need of farther *concoction*, as the other doth, which therefore is received into the *Stomack*, and there *chylified*. The thin, and crude *milk*, such as is found in the *breast* presently after delivery, is like this. For the dissolved *White* of an *Egg*, and the crude and watry *milk* in the *breast* or *udder*, are of the self same colour, taste, and consistence. Also the first *milk* given, is serous, and watry; and *Women* in *Childe-bed* do milk a kinde of water out of their *breasts*, before the *milk* is concocted, and perfectly *white*.

And

And therefore the *Colliquamentum* found in the *Chickens* crop is a kinde of crude *Milk*; and the very same afterwards found in the *Gisard*, is concocted, white, and coagulated. So likewise in *Viviparous Animals*, before their *milk* is digested in their *breast*, it looks like a kinde of *Dew*, or *Colliquamentum*; and so on the contrary, the *Colliquamentum*, after it is concocted in the *Stomack*, puts on the likeness of *Milk*. Whence it comes to pass, according to *Aristotles* opinion, that the first and most principal parts are fashioned out of the finer and purer materials: but of the courser, (by a new concoction in the *Stomack*) refined, the meaner and inferiour sort of parts are made: so that *Nature* like a kinde, indulgent mother, would rather abound with *Supernumeraries*, then be scantied in *Necessaries*. Or rather, we must affirm it consonant to reason, that the *fœtus* now grown more perfect in himself, should also be sustained after a more perfect manner (*viz.* by the *Mouth*) and attract his *aliment* more refined, and rendered more devoid of dreggs, by the two precedent *Concoctions*; (As being thereby cleansed from two several sorts of *Excrements*.) At first, indeed, being sustained by the *Umbilical Vessels*, he lives like a *Plant* supplied by its root; and hereupon his body looks indigested, white, and imperfect; and like a *Plant*, he remains fixt, and immoveable. But so soon as he enjoys the same *aliment* more elaborate, as now inspired with a diviner spirit, and triumphing in a higher pitch of *Vegetation*, the former *Gelly* is transformed into *flesh*, the *Organs* of motion are distinct, the *spirits* are enriched, and he himself begins to move: and now no longer is cherished like a *Plant* by his roots, but lives the life of an *Animal*, and is nourished at the *Mouth*.

Of

Of the Uses of the whole Egge.

EXER: LIX.

HAVING declared those mutations, and several proceedings, which are required in a *Hen-egg*, in order to the production of the *Chicken*; *Fabricius* proceeds to discourse of the uses of the whole *Egge*, and of its *Parts*: and this not onely in a *Hen-egge*, but in all other kindes of *Eggs*. Where he also demands, Why some *Eggs* are heterogeneous, and compounded of diverse parts; and others are homogeneous, and similar? such as the *Eggs* of *Insects* are, and of those creatures, which are constituted out of the whole *Egge*, (by a *Metamorphosis*) and not generated out of one part of the *egge*, and nourished by the other, as the *Chicken* is.

But my business is not to treat of all *Eggs* in general (as not having in this Tract delivered their history) but onely of *Hen-eggs*, and the benefits or advantages arising from their parts: all which ought to tend to that, to which the Action of the whole is directed; which *Fabricius* truly observeth, to be nothing else but the *Generation* and *Augmentation* of the *Chicken*. pag. 50.

And amongst those things which relate to the Whole *Egge*, *Fabricius* doth recount the *Figure*, *Quantity*, and *Number* of the *Egges*. The *Figure* of the *Egge*, saith he, is round, that the whole bulk of the *Chicken* might be contained in the lesser space; for which cause God made the Universe Round, to comprehend all things: and for the same cause, this *Figure*, saith *Galen*, appeared alwayes most lovely, and convenient to Nature. Besides, in that it hath no angle exposed

l. 10. de us;
Part.

exposed to outward injuries; it is therefore esteemed the safest figure, and most convenient for the Exclusion of the Chicken. Now Fabricius upon this ground, ought to have assigned the reason, why Hen-eggs are not spherical (as the fry, or eggs of fishes, worms, and frogs are) but acuminate and oblong. What impediment is there which hinders them from this perfect figure? Therefore, in my judgement, the figure of the egge hath no influence at all upon the Generation of the Chicken, but is meerly accidental; which I the rather conceive, because there are so many several varieties of figures, even in the Hen-eggs only. For the figure differs according to the diversity of the Uterus, in which (as in a Mould) it receives its form.

Hist.an.l.
6.c.2.

L10.c.52.

Plin. ibid.

Aristotle, indeed, saith, That oblong eggs produce Hens, but the rounder, Cocks: But I have never yet observed any such thing. And Pliny affirms the clean contrary: The rounder sort of eggs, saith he, exclude Hens, and the rest, Cocks. And, to say truth, if there were any certainty to be collected hence, some Hens would ever generate Cocks, and other, Hens: for some do lay eggs which are alwayes of one and the same figure, that is, ever oblong, or ever round. And the oblong would rather exclude Cocks, because they are the more perfect, and better concocted; and therefore Horace esteemed them to be more pleasant then the round.

The Reasons alledged by Fabricius for the figures of the Eggs, we willingly pass by, because they are invalid.

As for the Magnitude of the Egge, that indeed doth seem to conduce to the largeness of the frutus, which is thence to be generated; for your great Hens lay fairer eggs. And yet the Crocodile Id.l.8.c.25 layes egges no bigger then Goose-eggs: no living crea-

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ture spreading into so large a bulk from so small an Original. It is also probable, that the largeness of the Egge, and the plenty of the liquours contained in it, do conduce something to the fecundity of the Egge: for the very small eggs (called *Centenina*) are all of them addle.

The Number of Eggs affords the same benefit, as plenty of Conceptions do in *Viviparous* creatures; that is, they are useful to the continuation of the species. For Nature doth commonly bestow a plenteous issue upon those *Animals* which are weak, and lyable to the insolences of other *Creatures*: recompensing the shortness of their lives, with the number of their offspring. Nature, saith Pliny, hath bequeathed this legacy to the Race of Birds, that the more fearfull amongst them, should be more fruitfull, then the more valiant. For since all Generation is designed by Nature for *Perpetuity* sake, it befalls those *Animals* more frequently, which are shorter lived, and obnoxious to outward injuries, that so their species may not decay. Hereupon, *Birds* of Prey, which excell in strength, and thence maintain their lives the longer, and remain in more security, do seldom lay above two eggs. Indeed, the Pigeon, Turtle, and Ring-dove, hatch but two eggs at once; but the frequency makes satisfaction for the paucity, for they hatch ten times a year. So that they Generate Much, though not Many.

Of

*Of the Benefits or Uses of
the Yolk and White.*

EXERCITATION LX.

pag. 47.

AN Egge, saith *Fabricius*, properly so called, is compounded of several parts, because it is the Organ or Instrument of the Generant; and *Galen* affirms, That every Organ consists of several parts. Which gives an occasion of doubt; whether every egge be not *Heterogeneous*, seeing every egge is an Organ. And indeed, every egge seems to be constituted out of several parts, even the very eggs of Insects, and Fishes: for they all consist of Membranes, Coverings, and Muniments: and the Matter also contained in them, is not altogether destitute of a dissimilar constitution.

Fabricius doth also farther conclude truly, with *Galen*, That some parts of the Egge are the chief Instruments of Action; others, such Instruments as the Action cannot be performed without them; others, as conducing to the better performance of the Action; and lastly, others, as usefull to the safety and preservation of all the rest. But he is deceived, where he saith; If we speak of the chiefe Action of all, which is the Generation of the Chicken, the chief cause thereof is the Seed, and the Chalaza; for these two are the prime cause of the generation of the chicken: the Seed being the Efficient cause, and the Chalaza the material onely. For, as *Aristotle* affirms, he must of necessity acknowledge, that the Generant must be within the Egge. But he denies the Cocks seed to be within the Egge.

Nor is he less mistaken concerning the Material cause,

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cause, out of which the Chicken is made by the sacrifice of the seed. For it is neither made of both the *Chalazæ*, nor yet of any one of them, as hath been discovered in our *History*. Nor is the Generation of the Chicken accomplished by a *Metamorphosis*, or delineation and division of the *Chalazæ*, but by an *Epigenesis*, as we have explained. Nor is the *Chalazæ* principally fructified by the seed, but the *vitellinula* rather, or the Eggs-eye, as we call it: out of which being enlarged, the *colliquamentum* doth result: and afterward in the *colliquamentum*, and out of it, the *Blood*, *Veines*, *Vesiculæ pulsantes*, and the whole Body is at last constituted. And upon his own confession, the seed of the Cock doth not so much as pass into the womb of the Hen at all: and yet notwithstanding it doth fructifie, not only the Eggs already formed, but those also that shall be formed hereafter.

To the Eggs second Action (which is the *Nutritio*, and *Augmentation* of the Chicken) *Fabricius* calls in the *White* and *Yolk*. The Quantity of the yolk and white, saith he, is proportioned to the better performance of the former action, as also to the absolution and just encrease of the chicken. The Egg-shell, and Membranes, are constituted for the safeguard of the whole, and also of the action of the Egg. But the veins, and arteries, which do convey the aliment, are such as without them the encrease and nutrition could not proceed.

But yet he leaves us in suspense, not knowing whether he mean the *Umbilical Vessels* of the *fetus* it self, or the *veines* and *arteries* of the mother, as those instruments by which the egg is augmented. And yet upon as good ground, both the *Uterus*, and the *Incubation* it self, may be reduced into this classis.

Come

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Come we then to the *Liquors* of the *EGGE*, namely the *Yolk* and *White*, for these are, rather than the other parts, instituted for the sake of the *fetus*, and also in them the second action of the *EGGE* is most remarkable.

Hist. an. l.
6. c. 2.

Hen-eggs are of two colours, and constituted of two liquors, which are fenced by distinct membranes, and kept apart the one from the other: and likewise, since they are distinguished by a two-fold propagation of *Umbilical Vessels* (whereof the one passeth to the *Yolk*, the other to the *White*) they themselves are in all probability of a different nature, and therefore of a diverse use and advantage. The *Yolk* and *White* of Eggs, saith Aristotle, do obtain a contrary nature; not onely in regard of Heat, but Power: for the *Yolk* is condensed by cold, but the *White* is not onely not condensed thereby, but liquified the more. So on the contrary, the *White* is condensed by fire, but the *Yolk* is not condensed by it, but continues soft, unless it be very much burned: And is more condensed, and dried by being sodden, then roasted. The *Yolk* being now warmed by Incubation, becomes more moist; for it resembles melted wax, or dissolved fat: whereupon also it fills a larger room than before. For by degrees, as the *fetus* is enlarged, the *White* is consumed and thickened: but the *Yolk* on the contrary, when the *fetus* is now compleat, seems to have lost little or nothing of its dimensions, but seems only to be more liquid and moist, even when the belly of the *fetus* begins now to be covered over with the *Abdomen*.

De gen. an.
l. 3. c. 2.

And Aristotle gives the reason of this difference: Because a Bird cannot compleat her offspring within her own bowels, she produceth the Aliment also together in the Egg. For in Viviparous creatures the nourishment of the foetus, which is called milk, is provided in a distinct

first part of the body; namely, in the Breasts. But Nature hath implanted this aliment in the Eggs of Birds: but yet contrary to the Opinion of most men, and the Assertion of Alcmaeon Crotoniates; for the White is not the Milk of the Egge, but the Yolk. For as the fetus of Viviparous Animals, adhering hitherto to their parent (as the Plant doth to the ground) attract their first aliment from her womb: but after their birth, being then seated without the Uterus, they suck milk from the breast, and so encrease: so the Chicken findes something proportionable to both these aliments in the Egge it self: for as the Uterus of Viviparous Animals is within the parents themselves; so on the contrary, in Oviparous, the parents themselves may be said to be within their Uterus. For an egg is as it were an exposed womb; wherein there is a substance concluded, as the Representative, and Substitute or Vicar of the Breasts. For the Chicken in the egg is first nourished by the White, which being exhausted, it is afterwards sustained by the Yolk, as by Milk. And therefore the Navel or Umbilical propagation, which is derived into the White; when the white is spent, doth fade, and break off before the Chicken is hatcht, leaving no track or relique remaining, but quite vanisheth, before the Lower belly is shut up in the Abdomen (when yet in the race of Viviparous Animals the Navel-string continues still:.) But as for that other propagation of the Umbilical Vessels, which is disseminated into the yolk (when the abdomen is now drawn over the guts) it is, together with the yolk it self, laid up in the belly, & thence attracts nutriment for the tender fetus; till the bill, being now confirmed, & hardened, is able to pick up, and break its meat into pieces, & the Stomack, or Gizzard, be fortified to digest it: As

the production of *Viviparous Animals* is sustained with *milk* from the *Dug*, till it be provided of teeth, by which it may chew and grind its food. For the *Tolk* is instead of *Milk* to the *Chicken*: and therefore a *Hen-egge* (being to supply the office both of the *Womb* and *Breast* or *Udder*) is furnished with a party coloured juice, namely the *Tolk* and *White*.

And as for these two distinct *Liquors* all men living do admit them; But I, as I lately told you, have discovered even two distinct *Whites* in an egg, divided by two distinct *Membranes*, the superior *White* comprehending another within it; just as the *Tolk* is comprehended by the *White*. And these two *Whites* are of a different nature: being reserved in a distinct place, and contained or concluded in a distinct *Membrane*, and therefore designed to a distinct use and intent. And yet both are designed to *Nutrition*: but the exterior is first devoured, as having the propagations of the *Umbilical Vessels* (which are derived to the *Whites*) first disseminated into it, before they pass into the other *White* which is thicker then it: just as those very propagations do first assault both the *Whites*, ere they set upon the *Tolk* which is encompassed by them, and which is reserved for the last nourishment of the *fetus*.

But of this more hereafter, when we come to explain the manner, how the *fetus* of *Viviparous Animals* is formed, & augmented in the *Womb*, and also to demonstrate, that every *fetus* what ever doth derive its original from an *Egge*; and is sustained by a twofold *Albugineous Aliment* in the *Uterus*. For one of these is thinner, and contained within the *Egge* (or *Conception*) it self: the other is attracted and drawn by the *Umbilical Vessels* from the *Cotyledones*, or *Orifices* of the *Vessels* disseminated

ted into the *After-birth*, and the *Womb*. That substance is contained in the *Conception* it self, doth resemble the thinner *White*, both in colour, and consistence, for it is *gleny*, *liquid*, and *pellucid*, and very like that substance, which we call the *Colligamentum* in the *Egg*, and in this the *fetus* swims, &c. is fed by it at the *mouth*. But that which the *fetus* attracts by the aid of his *Umbilical Vessels* from the *Placenta* or *After-burden*, is more thick and mucous, and very like to the thicker *White* of the *egge*. By which it plainly appears, that the *fetus* is no more sustained in the *Womb* by his mothers blood, then the sucking *Child* is afterwards nourished by it, or the *Chicken* in the *egge*: but is fed by an *Albugineous Matter*, which is concocted in the *Placenta* or *Cake* of the *Womb*; and doth resemble the *White* of an *Egge*.

Nor is the contemplation of that divine providence lesse profitable, then wonderful; by which nature both in the *Generation* and *Growth* of the *fetus* (as taking into her consideration their ages and abilities) provides a convenient aliment for each of them, accommodating meats of more easie to some, and of more difficult digestion to others. For as the *fetus* attains a greater strength and ability to digest; so is a grosser and tougher aliment provided for him. And this may be observed even in the diverse kind of *Milk* in *Animals*: for when the *Infant* is new born, the *Mothers Milk* is thinner, and of more facile digestion; but in process of time, and the strength of the *fetus* being now improved, it growes thicker and more coagulated. And therefore those choice and delicate Dames, which do not suckle their *Infants* themselves, are injurious to their *Childrens* welfare; for since mercenary *Nurses* are for the most

part of a ranker constitution, then they : and so have older *Milk*, and more coagulated, and consequently of harder digestion ; it often falls out, that the *Infants* which are born of such Mothers cannot away with the *Milk* of such *Nurses* (especially about the time of breeding their *Teeth*) but by reason of crudities, or corrupted *Milk*, are tormented with *Feavers*, *Loosness*, *Vomitings*, *Paines* in the *Guts*, *Coughs*, and *Epilepsies*, and the like.

pag. 34. That which *Fabricius* affirms, and indeavours to strengthen with certain arguments : namely, that the *Chalazæ* are the subject matter of the *Chicken*, we have formerly disproved in our History, and have withal made it appear, that the substance and first lineaments of the *chicken* are laied, while the *Chalazæ* are intire, and unaltered : as likewise in a distinct place of the *Egge*.

pag. 54. Nor is it true that the *chalazæ* (which he conceivs the cocks seed doth fructifie) do supply the office of seed, that so the *chicken* might be made out of them.

pag. 57. Neither do the *chalazæ* so represent the seed, in colour, substance, or propriety of body (as he would have it) or so resemble the picture of a *chicken* in an *egge* that is boiled, that we ought of right to conceive all the spermatical parts to be thence extracted. But we are rather to conceive that the *colliquamentum* mentioned by us, or the thinner part of the *white* resolved, and concocted, doth put on the nature of seed, and supply its place, as our eyes may evidence.

pag. 54. And therefore that contemplation of this reverend sage is too superfluous, where he saith : Since the whole substance of the *Animal* is constituted of two different, and contrary bodies ; namely, hot, and cold, & all the red and sanguineous parts being hot, as the *Liver*, *Heart*, *Spleen*, *Reins*, *Lungs*, and in short all

the fleshy, and musculous parts: and on the contrary, all the White and Bloodless, as the Ligaments, Nerves, Bones, Gristles; and all the Membranous parts, as the Stomack, Guts, Womb, the Pericardium, or Purse of the Heart and the like, are cold) these two diverse kind of parts, do, without question, require a diverse, and yet a like Aliment to sustain them; if that position be true, namely, *ex iisdem nutrimur, ex quibus constamus*, we are nourished by the same substances, out of the which we are made. Therefore of right, do the Spermatical cold, and white parts, require a white and cold Aliment; but the Sanguineous, the red, and hot parts, require a red and hot sustenance. And therefore of good right is the White of the Egg, which is cold and bloodless, deputed to nourish the cold, white, and bloodless parts; but the Yolk, as being a hot, red, and sanguineous Liquor, substituted to the hot, and sanguineous. For by this means all the parts of the Animal, may cater and procure for themselves a convenient and familiar nutriment. For we do by no means consent, that the diverse parts of the egge, are ordeined to nourish the diverse parts of the chicken, having formerly shewed, that the Heart, Lungs, Reins, Liver, Muscles, Ligaments, and all the parts of the whole body, do appear white and bloodless at the first.

And upon this argument of Fabricius, it would insue, that the Heart, Lungs, Liver, Spleen, &c. are not Spermatical parts, or constituted out of the Seed: (which he will upon no terms consent to) because they also are afterwards fed, and increased by Blood; for all things are made, and nourished by one and the same thing; because nutrition is onely a substitution of a like substance into the room of that which is lost.

Nor will it less distract him to make answer,

how (when the white is now clean exhausted) the cold, and white parts (namely, the *Ligaments*, *Bones*, *Brain*, *Spinal-Marrow*, &c.) are likewise nourished, and enlarged by the *Yolk*, the *Yolk* being no less a disproportionated aliment to these, then the *White* is to the hot, red, and sanguineous parts.

Nay, according to the fore-cited opinion, the hot, and sanguineous parts are to be the post-genit parts, or born last: that is, the *Flesh* after the *Bones*; the *Liver*, and the *Lungs* after the *Ligaments* and *Guts*: and the cold parts of the *body* are to be upon the *Forge* all the *while* the *White* is consuming; and after them the *hot*, when the *Yolk* begins to decline and wash it self away to supply their growth: so that all the parts could not possibly arise out of the same *Whites*. But all these matters are confuted by ocular experiment.

To confirm this: the *Egges*, or *Spawn* of *Cartilagineous Fishes* (namely, the *Ray*, the *Fork-fish*, and the *Dog-fish*) are partly coloured, and have a well complexioned *Yolk*; and yet all the parts of those very fishes (even the *Parenchyma* of the *Liver* it self) appears *white*, *cold*, and *bloodless*. And on the contrary, I have seen a race of *Hens* and *Cocks*, which are of a large stature, their feathers blackish, their *flesh* full of *blood*, and their *Liver* more ruddy then ordinary; and yet their *egges*, even the fertile ones, have exceeding pale *Yolks*, of no deeper a yellow then the *straw* of ripe *Barly*.

pag. 55.

Fabricius in the subsequent words, seems to retract his former speeches: saying, *But one thing is very wonderful both in the Yolk and White; that neither of them being blood, yet they are so neer of kin to blood, that they are but little different from it, and*
a small

a small matter keeps them from being, very blood it selfe : and therefore a little paines, and a slender concoction sufficeth to convert them into blood. And this is the reason why we alwaies discover those Veins and Arteries which are propagated into the membranes of the Yolk and White to be full of blood ; and yet the Yolk and White abide still in their own nature : but so soon as either of the two is attracted into the Vessels, it presently transforms into blood ; so neer allyed are they to blood.

Now if it is most certain, that blood is no less contained in those propagations of the Veins which are disseminated into the White, then in those that are derived into the Yolk : and each of these Liquors is so neerly related to blood, that a very smal matter will procure their transmigration into it; who will deny, that the blood, and consequently all the Sanguineous parts are as well nourished and enlarged by the White, as by the Yolk.

Hereupon Fabricius provides for his retreat : saying, Though all this be true, yet we are to conceive, that this substance, which is attracted from the Yolk and White by the Veins, is blood in that maner only, as Chyle is in the Meseraick Veins ; in which there is nothing discoverable but meer blood ; where as the Chyle hath onely received the shadow of blood, and is to be compleated in the Liver ; so that substance attracted by the Veins out of the Yolk and White, presently puts in the shadow and resemblance of blood, &c. Well, be it so : yet though he lurk in this shadow, he doth not salve the doubt, which is, why the Blood, and sanguineous parts may not, for the fore-cited reasons, be as well nourished by the White as the Yolk.

If he had said, that the hotter parts, are rather

nourished by, that *blood* (or Aliment contained in the *blood*, which is proportionable to the *Chyle*) which is attracted out of the *Yolk*, then out of the *White*: and so on the contrary, that the cold parts are supplied rather by that Nutriment which the Veins transport from the *White*, then from the *Yolk*, I should not have much opposed him.

The main thing that disturbs him in this business, is this, how the *Blood* can be made in the *Egge*; or what Artificer can transform the two Liquors into *blood*, when there is yet no *Liver* in Being? For he could not say that the *blood* in the *Egge* is derived from the *Mothers blood*. But saith, *This blood is rather wrought in the Veins then in the Liver: but it becomes a bone, a gristle, or flesh, &c. in the parts themselves, where it is exactly concocted, and assimulated, without any farther addition at all; not signifying by whom the blood which is in the Veins dispersed both into the Yolk and White, is concocted, elaborated, and made perfect, when as yet no Liver at all is extant, or any particle of the body, that might concoct or compleat it. And when he had formerly said, that the cold parts are nourished by the White, the hot by the Yolk; not mindful of his assertion, he here concludes the quite contrary, viz. that the same blood doth transmigrate into bones, gristles, flesh, and other parts.*

But he lets that grand difficulty, which so much disquiets the Physicians minds, glide by in silence, without taking any knowledge of it: namely, how the *Liver* can be the *Original* and *Author* of the *blood*: seeing that *blood* is not onely found in the *egge*, before any one of the bowels are framed at all: but Physicians themselves do teach, that

that all the substance or *Parenchyma* of the bowels themselves, are meerly so many affusions, or confluxes of blood. Is the Effect, the Author of its own Efficient? If the *Parenchyma* of the Liver is made of blood, how can the Liver be the cause of blood?

And the insuing passages are of the same batch, where he saith: There is also another use of the White, when it is now segregated from the Yolk: namely, that the *fetus* may swimme in it, and so be sustained, lest tending downwards by his own weight, hee might incline to one part rather then another, and so drawing the Vessels along with him, might break them in sunder: and to this use the purity and tenacity of the White do conduce. For if the *fetus* should take up his residence in the Yolk, he would easily descend down into the bottome, and so disorder and break the Yolk also.

A very weak construction this! For what doth the purity of the White avails to the sustentation of the Chicken? Or how can the White which is more thin, better support the Chicken, then the Yolk which is thicker and more gross then it? Or what danger is there, that the Chicken should fall down? Since the *egge* in Incubation lies always side-long, so that there is no fear of ascent, or falling down. True it is, indeed, that not only the Chicken, but every *fetus* whatsoever (while it is forming) doth swim: but that innatation is in the *Colliquamentum* spoken of by us, and not in the Yolk or White: and we have rendered the reason thereof elsewhere.

Aristotle (saith he) Writes, that when the Chicken is conceived, the Yolk ascends to the Obtuse Angle of the Egge, and the reason is, because the Chicken is formed out of the Chalaza, which adhereth to the Yolk; whereupon it behooves the Yolk, which is placed

placed in the middle to mount up to the larger part of the Egge; that so the Chicken may be there made, where there is a natural cavity, very necessary to the welfare of the Chicken. But the Chalaza is more fastened to the White, then to the Yolk.

But the reason of that ascent of the Yolk is this; the *Macula* or little cicatrice which appears in the coat of the Yolk, is by reason of the spirituous *colliquamentum* which is bred in it, dilated; and thereupon requiring more roome, doth tend towards the Obtuse Angle of the Egge: and so likewise that portion of the Yolk and White which is melted, is distended, and being now grown more concocted and spirituous, doth swimme upon the other parts that remaine crude: as those parts of water which are warmed in any vessels, arise from the bottome up to the top: an experiment approved by all Physitians, who holding the Urinal containing a thick and troubled Urine in warm water, do perceive the upper part thereof, to clear and grow transparent first. This following Instance will explain the matter. There is a device known to most men, which is intended rather for a jocular bable to gaze upon and laugh at, then for any useful implement; namely, a certain Glass-globe, which is almost filled up with clear water, wherein severall Glass-balls which are fraught with nothing but Air, do swim upon the surface of that water, which by reason of their levity do support severall figures (of quivered Cupids, armed Centaures, Chariots of the Sun, and the like) which else would all sink down to the bottom. So in like manner, this *Oculus pulli*, this Eye of the Chicken as I terme it, or first Colliquation, being dilated by the heat of the Sitting-Hen, and the Genital vertue in the Egge, and so made lighter,

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lighter, ascends to the top, and draws up the *Yolk* to which it adheres together with it. Hereupon the thicker *White* gives place to it, and the *Chalazæ* retire to the sides of the *Egge*, because the *Cicatricula*, which was formerly situate in the side of the *egge*, now mounteth directly upward.

Of the Uses of the other parts
of the Egge.

E X E R. LXI.

THe *Shell* is hard and thick, that so it may fence the *Liquors*, and the *Chicken* which dwells in them, from outward injuries. But yet it is brittle, and especially in the *Obtuse end*, and neer the time of the *exclusion* of the *Chicken*, lest it might obstruct the *Chickens* Exit. This *Shell* is also porous, for while an *egge* (especially a new-laid one) is in roasting before the fire, it doth breath out a kind of sweat, trickling down, as it were, drop by drop. Now these pores are useful for *Ventilation*, as also for the more easie *penetration* of the heat which results from the *Sitting Hen*; and likewise that the *Chicken* may attract aire from without: for as we have said before, the *chicken* doth, without all question, both breath, and cry before his *exclusion*.

The *Membranes* serve to contain the *Liquors*, and therefore they are as many in number, as the *liquors* are. And the *Colliquamentum* also, so soon

as

as it is in being, is presently invested in its owne proper tunicle: as *Aristotle* did imply in these words. *A membrane also, variegated with sanguineous fibres, doth now incompass the white Liquor, &c.* But now when the exclusion of the *Pullus* is at hand, and the *White* and *Colliquamentum* are exhausted, all the *Membranes* (excepting onely that which embraceth the *Yolk*) are dried away, and vanish: but that *membrane* is together with the *Yolk* drawn into the *Peritonæum*, and concluded in the lower *Belly*. Now of these *membranes*, two are common to the whole egg, which they do immediately comprehend next under the *Shell*; but the other are proper *membranes*, relating to the *White*, the *Yolk*, and the *Colliquamentum*: but they all of them serve to the preservation, and distinction of those parts which they embrace. Of the two *Common coats*, the exterior which doth stick to the *Shell*, is the tighter, that so it may not suffer violence by the neighbourhood of the *Shell*, but the interior is smooth and soft, that so it may not prejudice the *Liquors*, as the *Meninges* or *membranes* called *dura* and *pia mater*, do defend the *Braine*, from the roughness of the *Scull*. The interior, and proper *membranes* do, (as I have said) embrace, and distinguish the *Liquors*: whereupon they are very thinne, transparent and fraile.

Fabricius doth indeed highly extoll the *Chalazæ*, (as those parts out of which he conceived the *Chicken* was framed) but as for the *Macula*, or little *Cicatrice*, which is bred adhering to the tunicle of the *yolk*; he concludes it to be a useles thing, esteeming it to be no more then a bare relique or remainder of the stalk broken off from the *Vitellary*, or superiour *Uterus* of the *Hen*. For (according to his perswasion) the *yolk* did formerly

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ly attract its sustenance through that stalk, or the Vessels passing through it; but the yolk being now no longer nourished by the Hen, but disjoined from the Ovary, there still continues a sign or track of the former conjunction, and the benefits received thereby.

But I on the contrary apprehend, that there is no other use of the *Chalazæ*, beyond that which I formerly observed; namely, that they should be as the Poles of that *Microcosme*, and the ends or connexions of all the membranes wound up together, whereby the liquors are not onely continued each in their proper places, but also retain a just and convenient position in relation to one another. But as for the fore-said *Macula*, I am certain, that it is of the greatest concern and consequence of all; as being the chief Center of the Egg, wherein the *Innate heat* hovers and lurks, and out of which, as out of the first spark, the soul her self is lighted; and lastly, for whose sake, all the liquors, and their respective coverings are constituted, and made.

Heretofore, indeed, I was of *Fabricius*'s mind, deeming this little *Cicatrice* to be nothing else but the remainder or track of the stalk broken of; but afterwards, upon more accurate observation, I discovered, that the stalk, whereunto the yolk is annexed, is not inserted into any little cranny or cavity of the yolk (as it is with the stalks of Apples, and Plums) and that so some track or print of the connexion or dependance which the yolk once had upon the Ovary, should continue in it; but that the stalk, before it arrives to the Yolk from the Cluster, is all the way dilated into a round, (like a little trumpet) that so it may encompass the

382 *Of the Uses of the rest of the Egge. Ex. LXI.*

the *horizon*, or the circle of the Yolk, which divides it into two parts; (as the *Tunica Amphiblastoides*, or tunicle which resembleth a litle round Casting-Net, doth the Egg) so that the superiour part of the Yolk, or Hemisphere, which looketh towards the Cluster, is quite free from any contact or coherence of the stalk, & yet the fore-mentioned *Macula*, or litle *Cicatrice*, is seated upon the superiour part of that litle cup, or portion of the *membrane* of the Yolk; (something inclining towards the side) so that this *Macula* can upon no terms be said to be the print of the stalk broken off from the Yolk. But of how great importance this *macula* is in the generation of the Chicken, hath already been discovered in our *History*.

It now remains, that following the steps of *Fabricius*, who was formerly my Tutor, and is now my Guide, I should declare the uses of that Cavity which is in the *obtuse part* of the Egge.

Fabricius recounts several conveniences arising from it, according to its several magnitude: which I shall declare in short, saying, It contains aire in it, and is therefore commodious to the *Ventilation* of the Egge, to the *Respiration*, *Transpiration*, and *Refrigeration*, and lastly to the *Vociferation* of the Chicken. Whereupon, that Cavity is at the first very litle, afterwards greater, and at last greatest of all, according as the several recited uses do require.

And thus farre have we discoursed, concerning the Generation of the Egge and Chicken, and the Uses of all the parts of the Egge; according to which discourse, we are to conclude and give judgment concerning all kinds of *Oviparous productions*. We are now to declare the manner of the Generation of *Viviparous animals*, according to the

Ex. LXII. That an Egg is the Common, &c. 383

the example and pattern of the Generation of some one *Viviparous Animal* which is perfectly known, and discovered, by us.

That an Egg is the Common Original
of all Animals.

EXER. LXII.

Animals, saith Aristotle, have this in common together with Plants; that some do spring out of seed, and some of their own accord: for as Plants do either arise from the seed of other Plants, or else spring up of their own accord, having attained some principle fit for their production: and some of them do attract aliment to themselves out of the earth, and some again are bred in other plants: so some Animals are generated by the cognation or affinity of their form; and some of their own accord, no seed at all proceeding which is of kin to them: whereof some are generated out of putrefied earth or plants, (as several Insects) others are begotten in Animals themselves, and out of the excrements of their parts. But this is common to all those (whether they be generated of their own accord, or else in other Animals, or out of the putrefaction of their parts, or their excrements) namely, to arise out of some principle fit for that purpose, and by some efficient contained in that principle: so that All living creatures must of necessity have a principle out of which, and by which they are begotten. Give me leave to call this principle, *Primordium vegetale*, the vegetal principle; namely,

Hist. an. l.
I. c. I.

namely, some corporeal substance, having life in it *in potentiâ*, or something subsisting of it selfe, which is apt to be transformed into a *vegetative form*, by some internal principle acting in it: Namely, such a principle as the *Egge*, and the *seed* of *Plants* is: such is the *conception* of *Viviparous Animals*, and the *Worm* of *Insects*, as *Aristotle* calls it: the principles of divers *Animals* being also diverse, according to the diversitie of which principles, the manner of the generation of *Animals* is diverse likewise: and yet they all consent and agree in this, that they spring from a *vegetal principle*, as out of a *matter* indowed with an *efficient* or *productive* virtue; but differ, in that this principle doth either result casually, or of its own accord, or else proceed from something pre-existent, (as the fruit thereof.) Whereupon those *Animals* are called *sponte nascentia*, spontaneous productions, these à *parentibus genita*, offsprings derived from their parents. They are also distinguished from their manner of *Birth*; for some of them are *Oviparous*, others *Viviparous*: to which *Aristotle* addeth *Vermiparous*. But if we may distinguish them, as they fall under sense, there are onely two *Species* or sorts of productions; namely, these: all *Animals* do either produce an *Animal Actiu*, actually; or *potentiâ*, potentially. Those *Animals* which produce an *Animal actiu*, are called *Viviparous*; and those that produce an *Animal in potentiâ*, *Oviparous*. For every principle which is only alive in *potentiâ*, we (with *Fabricius*) do conceive, ought to be called *Ovum*, an *Egge*: and as for that principle which *Aristotle* calls *Vermis*, a *Worm*, we do not at all distinguish it *ab Ovo*, from an *Egg*; and that because it looks like one to the eye, and also because that indistinction seems consonant to reason.

Hist. an. l.
I. c. 5.

son. For that *Vegetal Principle*, which is alive in *potentiâ*, is also an *Animal in potentiâ*. Nor is that distinction which *Aristotle* puts between an *Egge*, and a *Worm*, to be allowed of; for he calls that an *Egge*, *ex cujus parte fit Animal*, out of part of *Gen.an.l.* which an *Animal* is made: *quod autem totum mu-* 3.c.7.
tatur, nec ex parte ejus Animal gignitur, est Vermis: *Hist.an.l.*
 and that a *Worm*, which is wholly transformed, 1.c.5.
 and doth not produce an *Animal* out of some part of it only. But now these two do both agree in this, that they are productions not yet alive, but *Animals* onely in *potentiâ*; and therefore are both *Eggs*.

And *Aristotle* himself calls the very same things *Hist.an.l.*
Worms in one place, and *Eggs* in another: And 5.c.29.
 treating of *Locusts*, saith, *There eggs are corrupted in* *Ibid. c.30.*
Autumn, when it is wet weather: and (speaking of *Grasshoppers*) *When the litle worm*, saith he, *grow-*
eth in the ground, it becomes Tettigometra, a Grass-
bopper-matrix: and a litle after, *The females taste*
the sweeter after coition; for they have white eggs. Nay, in that very place, where he had raised a dis-
 tinction between a *Worm* and an *Egge*, hee adds; *Gen.an.l.*
But all this kinde of litle worms, when it hath attained 3.c.9.
the end of its magnitude, is made a kinde of Egge; for
their shell doth harden, and so long they continue with-
out motion: which is apparent in the worms of *Bees*,
 and *Wasps*, and also in the *Canker-worm*. And indeed every body may see, that the first rudiments
 of *Spiders*, *Silkworms*, and other *Insects*, are to be
 no less ranked in the classis and scale of *Eggs*, then
 the *spawn*, or *Egges* of *Fishes* which have softer
 shells, or of *Fishes* which have no shells at all, and
 almost of all sort of *fishes* whatsoever: which
Spawn of theirs is not actually an *animate body*,
 but yet *Animals* are begotten out of them. Since

therefore those creatures which do produce *actu Animal*, a Creature actually alive, are called *Viviparous*: doubtless, those *Animals* which do bring forth a creature which is alive *in potentia*, must be called *Oviparous Animals*, or else they cannot be comprehended under any *Common notion*; especially, seeing such Productions are *vegetal Rudiments*, proportionable to the *seeds* of *Plants*, such as an *egge* also is allowed to be. We must therefore conclude, that all *Animals* are either *Viviparous*, or *Oviparous*.

But because there are several *species* of *Oviparous Animals*, therefore the difference of Eggs is also several. For any kinde of *Rudiment* is not a competent Recipient of every kinde of *animal form*. Though therefore Eggs in a large or general acceptation do not differ, yet since some are *perfect*, and some *imperfect*, they are justly distinguished. *Perfect Eggs* we call those, which are perfected in the *Uterus*, and obtain there a requisite magnitude, before they are layed: as the *Eggs* of *Fowle*. But those we call *Imperfect*, which are excluded ere they are ripe, and have not yet attained their just bulk, but do expect that abroad, after they are layed; as the *Spawn* or Eggs of *Fishes*, that have a softer shell, and of *Fishes* which have none at all; and likewise the *Rudiments* of *Insects* (which *Aristotle* calls *Worms*) are to be listed in this rank: as also the *Rudiments* of those Creatures which are spontaneous productions.

Moreover, though some kindes of *perfect Eggs* are party-coloured, as being compounded of a *yolk* and *white*; yet some of them are only of one single colour, as constituted of a *white* alone: so also amongst *imperfect Eggs*, others are properly so called, as out of which a *perfect Animal* is produced,

duced, as out of the Egges of Fishes : and others improperly, from whence an *imperfect Animal* proceeds ; namely , a *Worm*, or *Canker-worm* ; which is a kinde of *Medium* between a *perfect*, and an *imperfect Egge* : which in respect or comparison of its own *egge*, or *Rudiment* from whence it sprung, is an *Animal* indowed with *Sense* and *Motion*, and doth nourish it self ; but in comparison of a *Flye*, or *Butterflie*, whose rudiment is in *potentiâ*, it is to be counted no better then a *crawling-egge*, sustaining it selfe : like to a *Canker-worm*, which having now attained its perfect magnitude, is transformed into an *Aurelia*, or perfect *Egge* ; and now ceasing to move any longer, like a very *Egge* indeed, is an *Animal in potentiâ*.

In like manner, though there are some Eggs, out of whose whole and entire substance (by a *Metamorphosis*, or *Transformation*) a perfect *Animal* is formed, which is not fed by any remaining portion of the *Egge*, but instantly seeks out for its maintenance abroad : and other Eggs, out of part of which a *Fætus* is constituted, and nourished by the remainder ; though (I say) there are so many several sorts and diversities of Eggs, yet nothing stands in the way, to forbid those to be called *Eggs*, which *Aristotle* styles *Worms*, (if we may give judgement upon things, according as they discover themselves to our sense and reason) since they are all *Vegetal principles*, not actually *Animals*, but in *potentiâ*, & the true seeds of *Animals*, proportionable to the seeds of *Plants* ; as we have long since demonstrated in a *Hen-egg*. All *Animals* therefore, are *Viviparous*, or *Oviparous* ; because they either produce an *Animal* actually alive, or else an *Egge*, or *Rudiment*, which is an *animal*, not *actu*, but in *potentiâ*.

The Generation therefore of all *Oviparous Animals* may be reduced to the example of *Hen-eggs*, or at least be easily deduced from thence : because the same things which are related in their history, may be discovered in the rest of *Viviparous creatures*.

But hereafter, when we treat of the Generation of *Insects*, and of *Spontaneous productions*, we shall discover how each of them are either differenced amongst themselves, or do else agree. For since every generation is a path-way to the attaining of the form of every *Animal* : according as *Animals* are either like, or unlike one another, so that their parts do neither specifically, nor generically agree ; so likewise is it usuall in their *Generations*. For Nature, who is a *Perfect Operatrix*, and consonant to her self in her Operations, doth design *Parts* that are alike, to *Operations* and *Functions* that are alike and agree ; and so likewise to the attainment of the same form, and the same end, she treads the same steps, and persists alwaies in the same method in the *Generation of Animals*.

Hereupon, in every perfect party-coloured egg of any fowle whatever (which is compounded of a *Yolk* and *White*, and fenced with a *Shell*) as we have still observed the same parts, as are in a *Hen-egg*, so have we ever found the same order and method of generating, and constituting the *fatus* (as in a *Hen-egg*.) And the self same things may also be observed in the Eggs of *Serpents*, and all *Oviparous four-footed Animals*, as the *Tortoise*, *Froggs*, and *Lizards* ; as from whose perfect and party-coloured egges, the *fatus* is framed and produced, the same way, as in others of the like kinde. But how *Spiders*, and the softer *Skew-fish*, as *Lobsters*, and *Shrimps*, and the race of *Fishes* that have scales and

no *shells*, as the *Cuttle-fish* and the *Calamire* do get out of their *Eggs*, or *Spawn*; as also how *Worms*, and *Catterpillars* do first creep out of the *Eggs* of *Insects*, out of which, at length retreating into the worm or vermine called *Aurelia*, (as into other new eggs again) at last a common *Flie*, or *Butter-flie* is generated; how these Creatures, I say, doe differ in their Generation out of *Eggs*, from the brood arising out of *Hen-eggs*, shall be declared in its due place.

Lastly, though all party-coloured eggs are not generated and fructified the same way; but some become *prolific* by the *Coiton* of a *Male* and *Female*, and others by other meanes, as the eggs or *frie* of *Fishes*; and though there be also a difference in the manner of the growth of *Eggs*, inso-much as some are nourished and encreased within their parents bowels, and others abroad: yet nothing hinders, why a *fetus* may not be produced out of any *egge* whatsoever, (in case it be a *perfectt egge*) as well as out of a *Hen-egge*. Wherefore, the *History* wherein we have already unfolded the generation of a *Hen-egge*, is satisfactory and full enough for the knowledge of the *Generation* of all other *Oviparous* creatures beside; as likewise to the knowledge of all those things which doe thence ensue, by way of *Corollary*, or *Deduction*.

Of the Generation of Viviparous Animals.

EXER. LXIII.

THus farre have we proceeded in the *Generation of Oviparous Animals*; it follows, that we now produce our Observations, concerning the other *species* of Viviparous productions: wherein we have found very many things which are altogether the same with those which occur in the *Esse*; which we have reduced hither to be consulted, and come last to be delivered. Which, though they are paradoxical, and run counter to the common received tenets, yet are they, if my judgment fail me not, entirely consonant to the Truth.

Amongst *Viviparous Animals*, Man is the chief, and most perfect of all: next him (that we may proceed from such as are more known) are ranked those creatures that are more sociable & obvious: (whereof some are *solidipeda*, whole-hoofed; as the *Horse*, and *Ass*: some are *Bifulca*, cloven footed; as the *Oxe*, the *Goat*, the *Sheep*, the *Hogg*, and the *Deer*: others *fissipeda*, *sive digitatis pedibus*, Creatures whose feet are distinguished into *Toes*; as the *Dog*, the *Cat*, the *Cony*, the *Mouse*, and the like; out of the manner of whose generation, we may conclude concerning the generation of all other *Viviparous Animals*. Wherefore, (as we have done in the *History of the Esse*, so) we shall single out some one kinde of these, as an *Exemplar* or *Representative* of all the rest; which, as being most known to us, will give light to the rest, and become

become a platform, to which all the other may be reduced, by way of *Analogy*.

I have already given you the reason, why I have drawn out documents concerning all other *Egges*, from the *Egges* of *Hens*: namely because those are cheap, and every mans purchase; and upon that score we our selves had the advantage to make the more diligent disquisition, and others also have the better opportunity to experiment the truth of our doctrine.

But there is more difficulty in the search into the *Generation* of *Viviparous Animals*: for we are almost quite debarred of dissecting the humane *Uterus*: and to make any inquiry concerning this matter, in *Horses*, *Oxen*, *Goats*, and other *Cattel*, cannot be without a great deal of paines and expense. But those who are desirous to make tryal, whether we deliver truth, or not, may assay the business, in *Dogs*, *Conies*, *Cats*, and the like.

Fabricius ab Aquapendente, as if every *Viviparous* conception were a kind of egge, begins his Tract with that; (as being the general exemplar of *Generation*) giving this amongst other, as the chief ground of his proceedings; namely, *because the contemplation of the egge, is of the largest extent: Ovi & for the greatest part of Animals, saith he, is generated out of Egges.* But we in the entrance of these our Observations, have concluded that all *Animals* are in some sort produced out of an *Egg*: For the *fetus* of *Viviparous creatures* is produced after the same manner and order out of a pre-existent conception, as the *Chicken* is formed and constituted out of an *Egge*: There being one and the same species of generation in them all, and the *exordium* or first principle of them all is either called an *egge*, or at least something answerable and pro-

De form. Pulli, c. 1.

portionable to it. For an *EGGE* is an exposed conception from which a *Chicken* is produced ; but a *conception* is an *egge* retained within, untill the *fætus* have attained its just bulk, and magnitude: in other matters it squares with an *egge* : for they both are *Vegetal rudiments*, and also *Animals in potentiâ*. Wherefore the same *Theorems*, and *Corollaries*, (though contrary to the received perswasion) which we have already inferred in the *History* of the *EGGE*, are most true : Likewise of the *generation* of all kind of *Animals*. For it is a confessed and plain thing, that all *fætuses*, even humane ones also, are procreated out of some conception, (or certain ground-work.) And this is also as true: that that thing which is called *Primordium*, the first rudiment in spontaneous productions, *semen*, the seed in *Plants*, and *Ovum* the *EGGE*, in *Oviparous* (as being that corporeal substance, out of which moving and operating by an intrinsical principle, that which is produced is either a *Plant* or an *Animal* :) that same thing in the *Generation* of *Viviparous Animals* is *conceptus primus* ; the first Conception ; and this is approved to be true both by sense and reason.

De gon. an.
l. 1. c. 18.

What we have formerly affirmed of the *egge*, namely, that it is the *sperme* and *seed* of *Animals*, proportionable to the *seed* of *Plants* ; the same do we now pronounce of the *conception*, which is the real seed of *Animals*, and therefore also called *An EGGE*. For that is true seed according to *Aristotle*, which takes its Original from two *Animals* joined in coition ; and obtains the virtue or power from both *Sexes* ; such is the seed of all *Plants*, and of some *Animals* which know no distinction of *Sexes* : as it were that which is first mixed from *Male* and *Female*, being a kind of promiscuous conception, or *Animal*.

mal: for these creatures have that in themselves alone, which is required of both Sexes: namely, a fit matter to feed the *fetus*, and also a *plastical*, or *formative*, and *operative* vertue able to produce it. So in like manner, the *conception* is the fruit of the Male, and Female joined in *coition*, and also the seed of the future *fetus*; wherefore it differeth not from an egg.

But that, which proceeding from the Generant, is the cause which first obtains the principle of Generation (*viz.* the Efficient) ought to be called the Geniture, but not the seed (as it is miscalled by the common people, and Philosophers too at this day) because it hath not in it that thing which is required of two in *coition*, neither is it proportionable to the Seed of Plants. But whatsoever doth possess the foresaid condition, and is answerable to the Seed of Plants, that also doth deserve to be called an Egge, and a Conception.

Also the definition of an Egge, delivered by Aristotle doth fully square to it: saying, An Egge is that thing in perfect productions of part whereof an Animal is made, and sustained by the remainder, after it is made. Now the same things agree to a Conception, as shall afterwards appear by the dissection of Viviparous Animals, our Eyes themselves being witnesses thereunto.

Besides, as a Chicken is hatched out of an Egge, by the fostering heat of the Sitting Hen, or some other asciticious hospitable patronage, so also the *Fetus* is produced out of the *conception* in the egge, by the soft and most natural warmth of the parent.

In a word: that which *Oviparous Animals* afford by *Incubation*, or gathering under their Wings and Breast; that is exhibited by *Viviparous*, by the Womb,

Womb, and neereſt, or inward embraces. And then, concerning that which relates to procreation, the *fetus* is produced out of the *Conception*, in the ſelfe ſame manner, and order, as the *Chicken* out of the *Egg*; With this onely difference, that in an *egge*, whatſoever relates to the *Conſtitution* and *Nutrition* of the *Chicken*, is at once contained in it: but the conception (after the *fetus* is now formed out of it) doth attract more *nouriſhment* out of his Parents *Womb*; whereupon the *nouriſhment* increaſes with the *fetus*. Moreover the *Egge* is quite emptied, when the *Chicken* is grown; and the *Aliment* which was in it conſumed, nor doth the *Chicken* attract any more ſuſtenance from the *Hen*: but the *Oviparous Fetus* doth ſtill finde out freſh ſupplies, and ſuſtaineth it ſelf by *Milk*.

Now the *Eggs*, or *Spawn* of *Fishes* are ſupported by food procured from without; the *Egges* of *Inſects* alſo, whether they have *ſhells* or not, have their proviſions from abroad, nor are they leſſe *eggs* for that, either really, or nominally: ſo in like manner the *Conception* deſerves the title of an *Egge*, though it be ſuſtained by a various kind of *Aliment* from without.

Why ſome *Animals* are *Oviparous*, and all do not produce their *Fetus* alive, *Fabricius* offers this reaſon: namely, becauſe *egges* (if they were detained in the *Uterus* till the *Pullus* were hatched) would by their weight prejudice the flight of *Birds*. And alſo in *Serpents*, or creeping things the multitude of *egges* would be an impediment to their winding motions. Nor is there compaſs enough in the narrow circuit of the *Snailles ſhell*, to afford room to the number & increaſe of *eggs*. So likewiſe the *Fishes bellies* are too ſcanty to

contain

contein their numerous Fry, should they grow within them. And therefore these several creatures are inforted to exclude their *births*, ere they arrive to perfection. So that it seems most natural for an *Animal*, to contein and cherish its conception within it self, untill the *fetus* be quite perfected : but nature is sometimes constrained to expose her issues immature, and imperfect, and to compleat them with provisions sought for from without.

For as much therefore as concerns *procreation*, All kind of *Animals* are generated after the same manner out of an *Egge-like Rudiment* : (which we call *Egg-like*, not that every *Rudiment* of an *Animal* doth resemble an *Egge* in Figure, but in Nature and Consistence) For in all their respective *Generations* this they have in common, namely, that a certain *Vegetal principle* is pre-existent (of like nature to an *Egge*, and answering in proportion to the *Seed* of *Plants*) out of which the *fetus* is produced. And this *Egg* or *Egg-like* substance is in them all, possessing the nature and conditions required in an *Egg* : which conditions also the seeds of *Plants* have common to them, as well as *Animals*. And for that cause, the principles of any kind of *Animals*, are called their *Fruits*, and *Seeds*, and so likewise the *Seeds* of all *Plants* may in a manner be called *Egges*, and *Conceptions*.

And to this purpose *Aristotle* speaks, saying : *De gen.an.* Those creatures which bring forth an *Animal* from l.3.c.9. within themselves, have something formed in them upon the first conception like unto an *egge* : for they have an humour conteined in a thin coat, such as that in an *egge* when the shell is pilled off. Whereupon those depravations of conceptions which fall out about that time,

time, fluxus vocant, the people call, *Fluxes*, or miscarriages.

Those Fluxes are chiefly observable in *Women*, when they miscarry in the first or second moneth: and such I have often seen discharged about those times: and such a one also *Hippocrates* reports to have been discharged, and fallen from the Minstrel.

Hist. an. l.
7. c. 7.

The first Conception, or Rudiment therefore of all Animals is in the Uterus: which according to *Aristotle*, is like an egg covered over with a membrane when the shell is pilled off. And this shall appear more clearly by what shall be said hereafter. In the interim we conclude with the Philosopher: All Animals, whether they be swimming, walking, or flying Animals; and whether they be born in the form of an Animal, or of an Egge: are all generated after the same manner.

The History of the Generation of Hinds and Does, is layed down as the Example of all other Animals; together with the reason of our so doing.

EXERCIT. LXIV.

O' Ir late Sovereign King *Charls*, so soon as he became a Man, was wont for Recreation, and Health sake, to hunt almost every week, especially

ally the *Buck* and *Doe* ; no Prince in *Europe* having greater store either wandring at liberty in the Woods, or Forreſts, or incloſed and kept up in Parkes and Chaces. In the three ſummer moneths, the *Buck* and *Stagge*, being then fat and in ſeaſon, were his game, and the *Doe* and *Hind* in the *Autumne*, and *Winter*, ſo long as the three ſeaſonable moneths continued. Hereupon (for the *Rutting time*, when the *Females* are luſty, and admit the *Males*, whereby they conceive and bear their young) I had a daily oportunity of diſſecting them, and of making inſpection and obſervation of all their parts ; which liberty I chiefly made uſe of in order to the *Genital parts*.

We ſhall therefore diſcloſe the *Generation* of all *Viviparous Animals*, out of the *History* of the *Hind* and *Doe*, as being the moſt commodious Exemplar : treating thereof after the ſame manner as we have already handled the *Generation* of all *Oviparous productions*, out of the *History* of the *Hen-Egge*. And this not from any peculiar deſign of my own, or for the ſame cauſes for which I did prefer the *Hen-Egge* to all other : but becauſe by the favour and bounty of my Royal Maſter (whoſe Phyſitian I was, and who was himſelf much delighted in this kind of curioſity, being many times pleaſed to be an eye witneſs, and to aſſert my new inventions) I had great ſtore of his *Deere* at my devotion, and frequent opportunity and liſenſe to diſſect and ſearch into them.

I intend therefore to ſet before you the *History* of *Hinds* and *Does*, compoſed out of my ſundry obſervations for many years together, whereby I my ſelf am chiefly verſed in them, and from whence alſo ſomething may be infallibly concluded concerning the *Generation* of other *Vivipa-*

rous Animals : which *History*, whilst we faithfully compile, we shall also insert all those observable Occurrences, which we have either casually met withall, or else attained by intended diffusions in other *Animals* ; namely, such as are *cloven-footed*, *whole-boofed*, and those which have their feet distinguished into *toes*, as likewise in *Man* himself : declaring the *series*, or order of the Formation of the *Fetus*, according to the several proceedings which Nature her selfe doth observe therein.

Of the Uterus of Hindes and Does.

EXER. LXV.

BEing about to treat of the Formation and Generation of the *Hinde* and *Doe*, we must first discourse concerning the place wherein those actions are performed, namely the *Uterus* ; (as we have already done in the *History* of the *Hen*) that so those things which ensue, may be more easily and rightly understood. For in this very thing, *History* hath the precedence of *Romance* and *Fable* ; namely, in that she describes events with their just circumstance of set times and places, and so guides us unto knowledge by a surer way.

But that we may the better conceive the *Deere's Uterus*, we shall explain both the *internal*, and *external* *fabrick* thereof, taking our pattern from the *womb* of *Women*. For *Man*, who is the most consummate or complete *Animal* of all other, as he hath obtained all other parts more perfect than they

they, so are his *Genital parts* also. And therefore the *Uterine parts* are most distinct in a *Woman*, and to us (by reason of the special industry of *Anatomists* about this *Part*) better known.

Now in the *Uterus* of *Hinds*, & *Does*, many things do occur which you may discover to be the same in the *womb* of a *Woman*; but yet some things do differ. In the *external orifice*, are neither the *labra*, nor the *Clitoris*, nor the *Nympha*; but onely two *Orifices* (whereof one is the *Orifice* of the *Bladder*, adjoined to the *Share-bone*; the other of the *Privy*, seated between the *fundament* and the *Urnary cavity*.) The membranous *Cuticle* (like to that which we have noted in a *Henne*) tending downwards from the *fundament*, doth cover the *veil*, and supply the office of the *Nympha* & *labia* of the *Privy*, in order to its defence from outward injuries: this *veil* is something retracted in a *Woman* in *coition*, or at lest forced to retreat by the entrance of the *Yard* into the *Orifice* of the *Privy*.

The *Suture* or connexion of the *Share-bones* being divided in *Hinds*, or *Does*, and the *leggs* laid wide open, the *Bladder* of *Urine*, and *Vagina Uteri*, or *Privy* wherein the *Yard* of the *Male* is entertained, as also the *neck* of the *Womb*, and its situation, are presently discovered, together with the *ligaments* whereby it is fastened, as likewise the *Veines*, *Arteries*, and *Testicles*, as they call them: also the *Horns* of the *Womb*, even in these creatures, are more remarkable then the other parts of it.

But as for the *preparing*, and the *leading*, or *ejaculatory vessels*, there are no such things to be found here; nor (as farre as I know) in any other *Female* whatsoever: And *Anatomists* (who suppose that the *Female* doth emit a *seed* in *coition*) make too industrious an enquiry after them; for they
are

are not at all in some; and in those in whom they are, they are never found in the same manner, or agreeing. Wherefore it comes neereſt to truth, which alſo (as I have obſerved) the greater part of *Women* acknowledg; namely, that they do not emit any ſeed in coition. And though the more ſalacious do diſcharge a certain moiſture in coition, yet I neither approve it to be fruitfull ſeed, nor neceſſarily conducing to conception; for very many do conceive without any ſuch effuſion at all: (and ſome alſo without any pleaſure) but of theſe more elſewhere.

The *Privy*, or *Vagina Uteri*, which is extended from the outward *Orifice* of the ſecret parts, to the inward *Orifice* of the *Womb*, is in a *Doe*, as in a *Woman*, ſeated between the *Bladder of Urine*, and the *Rectum inteſtinum*, or *Right Gut*, and is correſpondent to the *Yard* of the *male* in form, largeneſs, and longitude. And being diſſected, is diſcovered to be furrowed with oblong wrinckles and rugoſities, and alſo made glibb and ſlippery with a ſtiſſe moyſture. In its bottom, you may perceive a more narrow and cloſed *Orifice*, which is the beginning of the *neck* of the *Uterus*, through which, whatſoever is driven out from the cavity of the *Womb*, doth make its paſſage. And this is that *Orifice*, which *Phyiſitians* affirm to be ſo cloſely compreſſed, ſealed up, and concluded in a *Virgin*, and *Woman* with child, that it will not admit the point of the fineſt *Needle*, or *Probe*.

After this follows the *Neck*, or *Proceſſ* of the *Womb*, which is a much longer and rounder paſſage in them, then in *Women*; and in its whole extension, from the bottom of the *Privy* to the *Womb* it ſelf, is much more fibrous, thick, and nervous, then theirs. And if you make incision into this

Neck,

Neck, according to its longitude, you shall discover not only its exteriour ingreſs, which is conſpicuous in the bottom of the *Privity*, ſo exactly to connive, and cling together, that the air it ſelf though driven by ones breath, cannot arrive at the cavity of the *Womb*; but alſo five alike ſtreights more ranked in order, blocked up againſt the acceſs of any outward approacher, and ſticking firmly together by a glewy mucilage: juſt as the moſt compact and narrow *oriſce* of a *Womans Uterus* is locked up by a yellow glutinous ſubſtance. And ſuch narrow ſtreights as theſe, are diſcernable in the *neck* of the *Sheeps, Cowes,* and *Goats womb*, all which are cloſe locked up, and forbid any admittance (which *Fabricius* alſo obſerved.) But theſe five Recesses are moſt diſtinguiſhable in a *Hinde*, and a *Doe*, appearing like ſo many ſeveral *ports* or *oriſces* of the *Uterus* tyed up, and ſealed faſt, which you may juſtly eſteem as ſo many *Barracadoes* oppoſed to the admiſſion of any thing whatſoever. So carefull doth *Nature* ſeem to have been, that in caſe any inſolent intruder ſhould have forced the firſt gate, yet his rudeneſs ſhould be foiled by the next, making like proviſion in the other *Avenues*, that ſo nothing might inſinuate it ſelf into the *womb*. And yet for all this a *Probe* being put in from the Cavity of the *Uterus* outwards, doth with eaſe paſs through all theſe ports, and finde a way out. For it was convenient that a paſſage ſhould be afforded to the diſcharge of *Flatulencies, Menſtruous Blood,* and other *Humours*; but all entrance debarred to the entertainment of outward things, though they be never ſo little (as to the *air* it ſelf, or the *Seed*.)

This Uterine Orifice is alike blocked up in all

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other

other *Animals*, as it is in *Women*; whose *womb* we have known so closed sometimes, that their *Courses*, *Purgations* after delivery, and other *humours*, have for want of free disburdening, excited most terrible *Hysterical* affections, insomuch that I have been fain to invent an instrument proper to this inconvenience, whereby the *orifice* of the *womb* being opened, the imprisoned superfluities might be released, and the recited casualties subdued; as also that *injections* might finde a reception in the cavity of the *womb*, by which I have sometimes cured the internal *Ulcers* of the *Matrix*, and also *Barrenness* it self.

The *Cavity* of the *Uterus* in *Hindes* and *Does*, is exceeding small, as the substance of the *Uterus* is very litle both in magnitude and thickness. For the *womb* in those creatures, is only as a *Porch*, or *Fore-Gate*, in the *Cavity* whereof lyeth an open way both on the right, and left hand, which leadeth to the *Horns* of the *Womb*.

For those parts are different in almost all other *Animals* which have *Blood*, from what they are in *Women*; in whom the chief part of the *womb*, is the *Body* thereof: but the *Neck*, and the *Hornes*, (as being onely *Appendixes*) are scarce discernable. For the *Neck* is short, & the *Horns* litle, like round & long processes, extended upwards from the bottom of the *womb*, like two *Trumpets*; the *Anatomists* commonly conceiving them to be the *Ejaculatory vessels*. But in the *Hinde* and *Doe*, as in all other *Viviparous Animals* which have blood (except only *Women*, *She-Apes*, and those *Female Animals* that are *whole-hoofed*) the chief part for *Generation* is not the *Womb*, but the *Horns* thereof. For in *Women*, and *whole-hoofed Beasts*, the place of *Conception* is the *Womb*, but in other *Animals*, the

Conception

Ex. LXV. of the Uterus of *Hindes & Does.* 403

Conception is accomplished in the *Horns* of the *Womb*. And therefore *Authors* generally call those *Horns* by the name of *Uterus*, the *Womb*, saying, that the *Womb* in some *Animals* is bipartite, and in some not; understanding thereby the places of *Conception*, which are the *Horns* of the *wombe*, wherein almost all *Viviparous Animals*, presertime *multipara*, especially those that bring forth several young ones at a birth, doe conceive: and unto which also all the *Uterine veins & arteries* are conducted, and the other *Genital parts* are subservient. Wherefore give us leave also, in the *History* of those *Animals*, to use promiscuously the name of *Uterus* or *Womb*, and of *Horns* of the *womb*, for the same thing.

In a *Woman*, as we have said, the two *Trumpets* neer the proceß of the *Neck* of the *womb*, which are perforated into the *cavity* thereof, are not commonly reputed proportionable to the *Horns*, but are conceited by some *Anatomists* to be *Vasa Spermatica*, *Spermatical Vessels*; by others, *Spiramenta Uteri*, the *Pores* of the *Uterus*; by a third sort, *Vasa semen deferentia*, aut *reservantia*, *Leading Vessels*, or *Vessels* reserving the *Seed* in them. As if they were a certain kinde of *Seminal vesicles*; when, in truth, they are answerable in proportion to the *Horns* of the *womb* of other *Animals*; as appears clearly, by their scituation, connexion, largeness, perforation, form, and function: for as other *Animals* do alwaies conceive in the *Horns*, so a *Woman* also is sometimes found to bear her *Fetus* in *Cornu sive Tubâ*, in the *Horn* or *Trumpet* of the *womb*, as the most learned *Riolanus* reports by the observation of other men, and I have seen with my own eyes.

Anthrop.
l. 2. c. 34.

Those *Horns* do terminate in the *Common Cavity*,
D d 2 which

which (like a *Porch* or *Threshold*) is seated before them both ; and is in *Deer* proportionable to the *Womans uterus*, as the trumpets of the *Womans womb*, are proportionable to the *Horns of the Deers womb*. But their denomination they assume from their figure ; for as the *Horns of a Ram or Goat* are large at bottom, jutting out before, and again reflected backward ; so also these *Horns of the womb (in Hindes and Does)* at their original are large and ample, and lessening by degrees as they look upwards, are at last retorted towards the *Spine of the Back*. And as those other *Horns* are inequal, knotty, and wrinkled in their forepart, but behinde appear smooth and even ; so the *Horns of the Deers womb*, are below wrinkled, and gathered, by reason of certain cells or rings bunching out, in manner like the *Gut Colon* : but above (where they respect the *Spine*) they are smooth and even, and recurved, as if they were tyed back by a kinde of fillet-like *ligament*, and so by degrees grow slender as *Horns* do. If you take an *empty gut* (such a one as puddings are made in) keeping it contract, wrinkled, and streightned, by a tape or fillet which binds it all along on one side, you shall see it curled and distinguished into litle cells or windings (after the fashion of the *Colick Gut*.) And such is the fabrick of the *Horns of the womb of a Hinde, or a Doe*. In other *Females* the case is different, for they either have larger cells, or none at all. And in these *Horns of Hindes and Does* also, though there be several cells or windings, yet are not all of equal magnitude, but the first is much larger then any of the rest, and in it chiefly the *Conception* is contained.

And as in a *Woman*, the *womb*, and its trumpets (or *Horns*) with the rest of its appurtenances, are
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Ex. LXV. Of the Uterus of Hindes & Does. 405

tyed fast to the *Share-bones*, the *Back*, & the neighbour Parts, by the mediation of a broad and car-nous *Membrane*, (as by a pendulous band or tye) which Anatomists do stile *Vespertilionum alas*, the Batts wings; because the *Uterus* hanging in this manner, doth resemble a *Bat* with its wings spread abroad: so also in *Hindes*, and *Does*, the two Horns of the *womb*, together with the Testicles, and all the Vessels of the *Uterus*, are by a thick *membrane* fastened to the circumjacent Parts, (but especial-ly to the *Back*) which *membrane* performs the same office to the *Uterine* Parts, as the *Mesentery* doth to the Guts, and that which we call the *Meso-metrium* doth to the *Uterus* of the *Hen*. For as by the *Mesentery* the *Meseraick* Veins and Arteries are derived to the Guts; so are the *Uterine* Vessels disseminated through the fore-said *membrane*: in which also certain small Bladders and Glandules are on both sides discovered, which Glandules *Anatomists* commonly call the Testicles.

The substance of the Horns of the *Hindes* and *Does* wombs is *cuticular* or *skinny*, or else a *fleshy skin* or *coat* (like that of the Guts) besprinkled with certain slender Veins. This *coat* you may, as *Anatomists* use to do, divide into several *coats*, observing the several scituation of the *fibers*, which serve to several functions, namely to *Retention*, and *Expulsion*. For I have many times seen those Horns moving just like *Earth-worms*; in the same manner as any man may perceive the Guts, in an *Animal* newly killed, and the *abdomen* or covering of the lower belly laid open, stirring to and fro, in a kinde of waving *motion*, whereby (as if they were close begirt and bound in by some small narrow ring, or pressed and squeezed between ones fingers) they crowd down and depress

406 *Of the Uterus of Hindes & Does. Ex. LXV.*

the Chyle & Excrement towards the inferior Guts.

All the *Uterine Veins* do here (as in a *woman*) assume their original from the *Hollow vein*, neer the *Emulgents* : but the *Arteries* (which they also do partake as well as *Women*) do arise from the Branches of the *Great Artery*, which pass into the *Thighes* : and as in a *woman great with child*, the *Uterine Vessels* which contain *blood*, are more and greater then in the rest of her body ; so is it also with *Hindes* and *Does* which are with *Fawn*. But the *Arteries* (contrary to that Which we see in the rest of the *body*) are much more numerous for their proportion then the *Veins* ; and being blown into, they will distend, & fill their neighbour *veins*, but the *veins* being in the same manner blown into, will never do so much for them. And this also I see taken notice of by the learned *Riolanus*, and it is a prevalent argument for the *Circulation of the Blood*, which was my Invention ; for it doth clearly evince a passage from the *Arteries* into the *Veins*, but no retreat from the *Veins* into the *Arteries* again : & there are likewise more *Arteries* then *Veins*, because the *fetus* requires great store of sustenance to supply his growth, the remainder whereof fewer *Veins* are sufficient to return.

There are also *Testicles* discernable in these also, as they are in *Sheep*, *Goat*, and all *Animals* which cleave the *hoofe* ; but such *Testicles* as resemble the *Prostate*, or *seed Glandules*, and the *Kennels* of the *Mesentery* (whose office is to secure the divarications of the *Veins*, and retain a moisture in them whereby to keep the parts glib) rather then things designed to the concoction of *Prolifical seed*, and the *Reservation* or *treasuring* it up till it be fit for profusion in the time of *Coin-tion*. And this is my opinion of them, both for
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Ex. LXV. Of the Uterus of *Hindes & Does.* 407

sundry reasons elsewhere alledged: as chiefly, because that at the time of *coition* (when the *males* Testicles are swelled with *seed*, and full of seminal juice) the Horns of the *womb* indeed are in *Hindes* and *Does*, and all other *Viviparous Animals* (wherein they reside) much altered: but the *Testicles*, as they call them, (like things utterly unconcerned in the matter of Generation) do neither swell, nor differ any way from the constitution they were of (either before, or after *coition*) affording no testimony at all of their use either in respect of *Coition*, or *Generation*.

It is a wonderfull thing to see how great a quantity of *geniture* doth abound in the *Testicles*, and much distended Seminal Vessels of the very *masculine Moles*, and *Mice*, about the time of their *coition* (which we have also formerly observed in the *Dunghill-Cock*) and how vast an alteration is espyed in the Genitals of both Sexes; and yet these *Glandule*, or little *Kernels* (which men conceive to be the *Testicles* of the Females) do still reserve their wonted appearance, without any variation at all.

What we have hitherto observed, concerning the *Womb* and the Horns thereof in *Hindes* and *Does*, doth for the most part relate also to other *Viviparous Animals*, though they differ in a *Woman*; because she conceives in her womb, but all the rest in the Horns of the womb, except the *Mare*, and the *she-Ass*; and even they also, though they seem to bear their *Conception* in the womb, yet that place of *Conception* doth more resemble the nature and constitution of a *Horn*, then of a *Womb*: for that place is not *bipartite*, but something more oblong, and different from a *womb*, both in situation, connexion, fabrick, and substance,

stance, and ought rather to be compared to the superiour *Uterus*, or process of the *womb* of the *Hen*, (wherein the *Egge* groweth, and is encompassed with the *White*) then to the *womb* of a *Woman*.

Of the Coition of the Hinds and Does.

EXER: LXVI.

THe History of the *Womb* of *Hinds* and *Does*, is such as hath been shewed. Wherein we have briefly declared those things which did seem necessary to *Generation*, namely, the place of *Conception*, and those parts which are ordeined thereunto. It remaines that we now treat of the *Action* and *Function* of this place, namely of *Coition* and *Conception*.

Hinds and *Does* do admit their *Males* at one only set time of the year; that is about the midst of *September*, after the *Feast* of the *Holy Cross*, and they bring forth after the middest of *June*, neer the *Feast* of *Saint John Baptist*. So that they goe
 L.8. c.32. nine moneths, not eight, as *Pliny* would have it: for they calve or bring forth, with us at least, the ninth moneth after their first *Rutting*.

At *Rutting time* the *males* assemble themselves amongst the *females*, but at other times they feed apart: and the elder *Deere* (as the *Staggs*) do associate with their own *Sex*, and the *Hinds* and *Does* keep company and feed among the other *Hinds* and *Does*, together with the younger sort of *Ducks*, and *Fawns*. About a whole moneth their

Rutting

Ex.LXVI. Of the Coition of Hinds & Does. 409

Rutting time continues, which doth begin later, if the season be dry, but if it be moist and rainy sooner. And therefore in *Spain* (as I am informed) they seldom rut before the *Calends* of *October*, because moist weather comes not on there til then. But in *England* their *Rutting time* seldom lasts beyond the middest of *October*.

At that time their lust enrages them so, that they will assault or *Dogs* or *Men*, when at other times they are shie and timorous, and suffer themselves to be chased and put to flight upon the alarme of the least barking *curre* that is.

Every *Male Deer* knowes all his *Females*, and will not indure any one of them to straggle, but will pursue and bring her back to his *Herd*: and being now grown very jealous of them, he frequently surveyes them, and rangeth them together. And if perhaps a stranger *Doe* intrude among them, he is not very passionate in her expulsion, but affords her a fair departure: but if another *Male Deere* address himself to this *Herd*, he bids him a speedy defiance, and charges him with his *Head*.

The *Hind* and *Doe* are numbered amongst the chaster rank of *Animals*; because they do not willingly admit *Coition* (for the *Stagge* and *Buck*, like the *Bull*, do celebrate their *Coition* with violence) and unless they be over-mastered, or tyred out with assaults, they shun the act. And this seemes to be the cause of the assembling themselves together in a *Herd* to their own proper mates, and chiefly to those that are the elder *Deere*, and are best headed: for if a forraigner attempt their chastity, they presently fly to their own *Herd* and consort, for sanctuary, as the refuge of their affrighted modesty.

If a young Batchelour *Buck* finde a *Doe* straggling alone; he presently pursues, and having desired her by his chasing, he takes advantage of her inability for resistance, and so enjoyes her by force.

All the *Male Deer* provide themselves a *Rutting* place at some distance from the *Herd*, by digging up trenches, or standing behind some convenient rise of ground, whither they constrain their *Females* to appear. She that is now about the act of *Rutting*, placeth her hinder feet in the furrow or trench provided for the purpose, and (if occasion be) inclining her body doth something depress her *Hanches*; by which means the *Stag* or *Buck* may at one inition (as *Bulls* do) pressing her forward, finish his affaires.

The *Elder*, and abler *Stags*, and *Bucks*, have a larger *Herd* of *Hinds* and *Does*, then the junior and infirmer *Deer*: some assemble to themselves ten, some fifteen. Our *Keepers* say, that the *Females* are sated at the second coition, or third at the most, and she, so soon as she conceives, admits the *male* no more.

The *Male* when he hath fructified all his *Females*, his lust cooleth; and having impaired both his audacity, and his flesh, quits his *Herd*, straggles alone, and feeds greedily to repaire his broken strength, making no farther assault upon any *Female* all that year.

When the *Buck* growes first ripe for *Rutting*, the *Hair* about his *Throat* and *Neck* growes black; as also doth the extremity of his *prepuce*, which doth putrifie likewise, and stink extreanly.

The *Does* and *Hinds* are but very seldome compassed, and that too in the night time onely, and in obscure places, such as are purposely made choice

Ex. LVII. *The state of the Uterus of &c.* 411

choice of by the *Males* for that performance. If the *Stags* or *Bucks* chance to contest (which is usual) then the conquered his *Females* are all made the *Victors* purchase.

*Of the Constitution or Alteration of
the Uterus of the Hind and Doe
in the moneth September.*

EXERCIT. LXVII.

WE now come to the Alteration of the *Genital parts* of the *Hind*, and *Doe*, after *Rutting time*, and also to the conception it self.

In *September*, when the *Hinds* and *Does* first *Rutting time* is now arrived, their *Uterus* (I mean the *Hornes* of the *Uterus*, or the place wherein they conceive) is become more fleshy, and thick, and likewise more soft and tender. In the cavity of each of the *Horns* of the *womb* (in that part which resembleth a wrinckled fillet; namely, where it reflects towards the *spine* of the *Back*) five *Caruncles*, or soft *Warts*, or *Nipples*, do jet out, being placed in order: whereof the first is the biggest of all, and the rest as they lie in order, are still one less then the other; just as these *Horns* themselves do lessen by degrees from the bottom upwards, to the very top. Some of these *Caruncles* do grow out as broad as the middle finger, (appearing like a kinde of a luxuriant, fungous, fleshy substance) being paler or whiter then some, and more ruddy then others.

About

About the six and twentieth, or eight and twentieth day of *September* (as likewise afterwards in *October*) the *Uterus* is grown thicker; and the *caruncles* being now more tumid, do resemble the *Nipples* of Womens Breasts: so that you would believe they were designed to yeeld *Milk*. Their top or uppermost part being cut away (for I divided the outward *superficies* from them, to discover their interior constitution) I beheld them compacted and formed out of an innumerable company of white points, as out of so many bristles set up stiff and erect, by a certain mucous viscosity or glewy substance, and pinching them hard from the roots upward, between my fore finger and my thumb, I squeezed out of each of those white points a small drop of blood. Whereupon by a more strict enquiry, I discovered them to be nothing else, but the *Capillary productions* of so many slender *Arteries*.

At *Rutting time* therefore, the *Uterine Vessels* (especially the *Arteries*) are discovered to be more in number, and more conspicuous then at other times: Though (as I have noted before) those that are called the *Testicles*, are neither more large, nor more full then they were before, nor any thing changed from their pristine constitution.

The *Cavity* of the *Uterus* (that is, of the *Hornes* of the *Uterus*) and interior superficies thereof (which you may call the wall of the little *Cells*) presents it selfe exceeding soft and glibbe to the touch, like to the interior concameration of the *Ventricles* of the *Braine*, or the flesh of the *Nut* of the *Yard*, which is within the *Prepuce*. But in that *Cavity*, I could never discover any *Sperme* ejected from the *Male Deere*, nor any other thing which relates to the *conception*, (though I have made
most

most accurate dissection through all the entire months of *September* and *October*.) And yet the *Male Deere* did go to rut daily, and I dissected a great number of *Does*. And this is the result of many years experience.

I have seen indeed in some the *Caruncles* so neerly seated the one to the other, as if they had made one continued *protuberance* out of all the five united together. And when upon frequent experiment, I never met with any other thing within the *Cavity* of the *Uterus*, I began at first to consider, whether the *masculine seed* could by any means (namely either by way of *Injection*, or *Attraction*) insinuate it self into the seat of *Conception*? and at last my many repeated observations did ratifie this conclusion, namely, that no part or portion of the *seed* doth ever enter into those receptacles.

*What befalls them in the month
of October.*

EXERCIT. LXVIII.

HAVING made several dissections in the month of *October*, as well before the expiration of the *Rutting time*, as after: I could never finde any *seed*, or *blood*, or the *track* of any other thing whatsoever, in the *cavity* of the *Uterus*. Onely the *Womb* or *Uterus* was grown larger and thicker, and the *Caruncles* more tumid and florid then before, and out of them upon a close constriction

or

or pinching them between the fingers, some small drops of *blood* did issue out, as a *watery kinde* of *milk* is expressed out of the *nipples* of the *breasts* of such as are with *Childe*, about the fourth month of their *pregnation*. In the *Uterus* of one, or two, which was exceedingly impaired and extenuated contrary to the course of *Nature*, I found indeed a kinde of a green, ichorous putrified substance, like to impostumated matter, filling the *cavity* thereof; whereas those very *Does* were in all other points sound, and something fat, no less then their fellows which I dissected at the same time.

About the End of *October*, and the Beginning of *November*, when the *Rutting time* is now concluded, and the *Females* and *Males* part company: the *Uterus* began to seem of a lesser bulk (in some sooner, and in others later) and the wall or sides of the inner *cavity* appeared to tumefie, as if it were puffed up; for in those places where of late the little *Cells* were, there did now round gobbets extubérate inwards, filling almost the whole capacity: so that the sides now seemed to touch one another, and glewed as it were together, leaving no space vacant between them. For as licorish Boyes (while they plunder the *honey-combs*, that they may greedily devour the *honey*) have their *Lips* so stung by the *Bees*, that they swell and grow tumorous, and so streighten the gap of their *Mouths*; in the same manner doth the interior superficies of the *Does Uterus* become turgid, and most soft and pulposus substance (like that of the *Braine*) doth fill the *cavity*, and involve the *Caruncles* in it. And as for the *Caruncles* themselves, they are no bigger then they were before, but only appear something paler, and as it were macerated or stewed in warm water, as the *Nurses nipples*
look

look presently after the Childe hath had the breast. But I could not squeeze out any blood from them, as before.

This interior superficies of the *Uterus* being thus swolne; it is at that time so tender and smooth, as nothing can be more. It resembles the softness of the *brain* it self, and when you touch it, did not your own eyes give evidence to that touch, you would not believe your fingers were upon it. The *cavity* of the *Womb* being laied open immediately after the killing of the *Deere*, I have often discovered a slow waving motion, (such a one as is seen in the bottom of a creeping *Snails* belly) as if the *Womb* were *Animal in Animalis*, one living creature in another; and had a peculiar independent motion of its own.

Such a kind of motion as this, I have (as I mentioned but now) often observed in the intestines of creatures dissected alive: & the same may be experimented both by the testimony of the sight and touch, in live *Dogs* and *Conies*, though you dissect them not. I have likewise observed the same kind of motion, in the *Testicles* and *Scrotum* of the *Males*; and I have known some *Women*, whom such palpitations have deluded with the hopes of being with Child. But whether in *Hysterical* affections (such as are the *Ascent, descent, & contortion* of the *Uterus*) the *Womb* of *Women* move and stir by such a kind of agitation; as whether the *Braine* also in its *conceptions* be in like manner moved to and fro, as the discovery is very difficult, so is it worthy the attempt.

A little while after the foresaid *Extuberance* of the interior coat of the *Uterus* begins to shrink, and lessen: and in some, (but that is rare,) a certain *purulent matter* doth stick to the sides, (in manner

manner of sweat) such as is visible in wounds, and ulcers, when they are said to be *Concocted*, and cast forth a white, smooth, and equall matter. When I first discovered this kind of substance, I was in suspence, whether I should conceit it to be the seed of the *Male*, or some *concocted substance* arising from it. But because I did observe this matter but seldom, and in few onely, and also seeing twenty days were now past, since any commerce with the *male* had been celebrated, and likewise for as much as this *substance* was not thick, clammy, or froathy, (as *seed* is) but more friable and purulent, inclining to yellow, I concluded that it arrived thither casually rather, or else proceeded from over much sweat, the *Deere* being newly quite spent in the chace: and so in a *Rheume* falling down into the *Nose*, the thinner portion of the *Catarrh* being thickened into a mucous substance, puts on a yellow complexion.

This alteration in the Womb when I had often discovered to His Majesties sight (as the first assay towards *impregnation*) and having likewise plainly shewed that all this while no portion of *seed*, or *conception* either was to be found in the *Womb*; and when the King himself had communicated the same as a very wonderful thing to diverse of his followers, a great debate at length arose: The Keepers and the Huntsmen concluded, first, that this did imply, that their conception would be late that year, & thereupon accused the droughth; but afterwards when they understood that the *rutting time* was past, and gone; and that I stood stiffly upon that, they peremptorily did affirm, that I was first mistaken my selfe, and so had drawn the King into my error; and that it could not possibly be, but that something at leſt of the

Con-

necessarily in being, presently after *Coition*. And hence it follows, that it is not true, that in a *proliferical coition*, any matter is ready at hand in the *Vterus*, which matter or substance, the *Masculine seed* should concoct, coagulate and fashion, or reduce into an actual generation, or by drying its outward *Superficies*, *Form*, and *After-birth* to wrap it in. For nothing at all is to be found in the *Womb* for many days together, even to the twelfth of *November*.

It is also evident, that all *Females*, in the *Act* of *coition*, do not effund a seed into the *Vterus*; for neither in *Hinds*, or *Does*, or several other *Viviparous Animals*, is there any track or signe of either *Seed*, or *Menstruous blood*. But what it may be, which flowes from some salacious *Women* in *Coition*, as well as from *Men*, which procures pleasure to them, and a kind of resolution of their *Spirits*; as also whether it do necessarily conduce to the *Conception*; likewise whether it do proceed from the *Testicles*, or whether it bee *seed*, and whether *proliferical* or not, we have elsewhere discovered.

And while I am in this discourse, let the ingenious bear with me, (if being mindful of my great wrongs) I let slip a sigh or two, grounded upon this my misfortune: namely, that while I did attend upon our late *Sovereign* in these late distractions, and more then *Civil Wars*; (and that not by the *Parliaments* bare permission, but command) some rapacious hand or other not only spoiled me of all my *Goods*; but also (which is most lament) have bereft me of my *Notes*, which cost me many years industry. By which means many observations (especially those concerning the *Generation* of *Insects*) are lost and imbecilled to the prejudice (I may boldly say it) of the *Common-wealth* of *Learning*.

What

*What things happen in the Uterus of
Deere in November.*

EXER. LXIX.

ABout the twelfth or fourteenth day of *November* there is something, which is then first of all to be found in the *Cavity* of the *Womb* of the *Deere*, conducing to the future *fetus*, and this I truly avouch, and of many years Experience.

I remember indeed, that in the year of our Lord 1653, these signs or rudiments of *conception* did appear sooner, because it was a cloudy, and wet season. In *Hinds* also, which go to *Rut* six or seven days before the *Does*, I have still discovered some track of the future *conception*, about the eighth or ninth day of *November*. But what that is, and how it doth begin, I shall now declare.

A little before any thing at all is to be seen, the substance of the *Vterus*, or *Hornes* appear lesser, then when the *females* first went to *Rut*; and the white *Caruncles* are more flabby (as I informed you before;) and the *protuberance* of the inward coat doth a little abate, growing more wrinkled, and moist. For about the time aforesaid, some certain mucous *filaments* (like the *Spiders threads*) are led from the last or upper angle of the *Hornes* of the *Vterus*, through the midst of both the *Horns*, and also through the *cavity* of the *Womb*, which being joined together, do resemble a membranous or filmy coat, or empty wallet. And as that complication or web of vessels called *plexus Choroides*, is led through the *Ventricles* of the *Brain*, so this

little oblong sack, or wallet is spun over all the space of both the Horns, and the intermediate cavity of the womb. In which dissemination, insinuating it self into the rugosities of the flagging membrane, it doth insert slender fibres between the fore-mentioned round extuberances or nipples; after the same manner as the membrane called *Fia Mater* doth work it self into the convolutions of the braine.

A day or two being now over, this wallet is filled with a watry, white, stiff, albugineous substance, and being stuffed with that moisture, doth resemble a long pudding, sticking or cleaving a little to the containing sides of the *Vterus* by its exterior glutinosity; and yet so, that it may be easily separated from them: for being taken in the narrow part of the *Vterus* (where it is tied to it as it passeth along) it may be brought away entire from both the Hornes, if it be warily handled.

This Conception now grown, and taken out, is of the figure of a wallet, or double pudding: being besmeared on the outside with a kind of purulent filth; but within it is glibbe, containing in it a stiff moisture, much like to the more liquid *White* of an *Egge*.

Now this is the first Conception of *Hinds* and *Does*. And seeing the nature and condition of an *Egge*, together with the definition is applicable thereto, for *Aristotle* defines an *Egge*, to be that thing out of part whereof an *Animal* is begotten, and the remainder is the food of that *Animal* which is begotten: and likewise, seeing it is the ground-work or rudiment of the future *fetus*, it is therefore also called *Ovum Animatum*, the *Animals* *Egge*, According to that of *Aristotle*. Those creatures which beget an *Animal* within themselves, have upon

Hist. an. l.

l. c. 5.

de gen. an.

l. 2. c. 1.

de gen. an. l. 3.

c. 9.

the first conception something formed in them in manner of an egge. For a moist substance is contained in a Membrane, just as if you should pill off the shell from the egge: whereupon the depravations of these conceptions are called fluxes. This Conception therefore, as we said before of an Egge, is a true sperme, or seed, embracing in it self the virtue of both Sexes, and proportionable to the seed of Plants. Aristotle *Hist. an. l. 7. c. 7.* therefore describing the first Conceptions of Women, which they are, as it were, an Egge covered over with a Membrane, but the shell taken off: such as Hippocrates records to have dropt from the Minstrel, and others: I have often seen fallen from Women in the second Moneth, which was of the bigness of a Pigeon's egge, without any fetus at all in it: and sometimes about the bulk of a Pheasants, or Hens egg: and at this time the floating Embryo is of the longitude of the nail of the Little-finger. But the Membrane involving the Conception, hath not yet attained any After-burden to which it may be fastened, nor is it fastened to the womb it self; but only at its obtuser and upper end; as if it were stuck with moss or down; it presents to our view the first designs and rudiments of the After-burden, or Cake of the Womb: but the inner superficies being smooth and glib, is divaricated with the several propagations of the Umbilical Vessels. At the third Moneth, this Egge exceeds a Goose-Egge in magnitude, and infolds within it an Embryo of the length of two transverse fingers. At the fourth Moneth, it is larger then the Egge of an Ostrich. And thus much I have diligently observed in Abortions, having made several dissections of them. And in this manner do Hinds and Does, though for a whole moneth together (and more) after their Rutting time, no sensible thing at all be con-

tained in their *uterus*, produce by a kinde of *Con-
tagion*, these *conceptions* and *rudiments* in the shape
of eggs, (as *Plants* bring forth their *seed*, and *Trees*
their *fruit*) which about the eighteenth or one and
twentieth day of *November* (at the farthest) are
compleat; and that sometimes in the *Right Horn*,
and sometimes in the *Left*, and at other times in
both: having in them a certain dissolved sub-
stance, transparent, & crystalline (which we call
the *Colliquamentum*, or *Eye* in the *Hon-egg*) which is
contained in a proper thin orbicular coat of their
own, being much purer then that humour where-
in the *Conception* swims afterwards; in the middle
whereof the *sanguineous fibers*, & the *Punctum saliens*
(which is the first foundation of the future *fetus*)
without the presence of any thing else, are clear-
ly discerned; and this is the first *Genital particle*.
Which being constituted, not onely the *Vegetative
soul*, but the *Motive* also is said to be in it; from
which all the other parts of the *fetus* are each in
their order generated, formed, disposed, and en-
dowed with life: after the same manner as we
have declared the *Chicken* to be constituted out of
the *Colliquamentum* of the *Egg*.

Both these humors are in the *Conceptions* of all
Viviparous Animals; which many men conceive to
be the *Excrements* of the *Fetus*, deeming the one
to be its *urine*, the other its *sweat*; when not-
withstanding they have no offensive taste at all,
and are alwayes most manifest in the *Conception*,
even before any particle of the *fetus* is discern-
ed.

The Outward coat which embraceth both the
humours, is called *Chorion*; the Inward, *Amnion*.
And more then these two you can never finde; the
former, involving the whole *Conception*, and extend-
ded

ded over both the *Horns* of the *uterus*; the later, swimming in the first *water*, and contained onely in one of the *Horns*, except there be a *Twin-fetus*; in which case, there is one in each of the *Horns*: as in the *Gemellifical Egge* there are two *Colliquamentums*. So that where there is a double *fetus*, they are both contained in one and the same *conception*, together with their two-fold *crystalline waters*: (as in one and the same *Egg*.) If you make an incision into any part of the *Exterieur membrane*, the more impure *water* will presently issue out from both the *Horns*; but the *crystalline water*, which is comprehended in the *interiour membrane* called *Amnion*, doth not flow forth with the former, unless you have peirc'd it also.

The *Vein*, which is first seen within the *Amnion*, in the *crystalline humour*, takes its original from the *Punctum saliens*; exercising the office, and partaking of the nature of the *Umbilical Vessels*; and being by degrees enlarged, it is disseminated into other *ramifications*, which are scattered into the *Colliquamentum*: whereby it is most evident, that the *nutriment* is at first attracted from the *Colliquamentum* only, wherein the *Fetus* swims.

Having dissected the *uterus*, I have expos'd this *Punctum saliens*, while it yet continued its palpitation, to the view of our late dread *Sovereigne*; which was then so small, that without the advantage of the *Sun-beams* obliquely illustrating it, he could not have perceived its shivering motion.

The entire *Colliquamentum* being cast into a silver or tinn-Bason, which is full of clear warm *water*, doth very neatly lay open the *Punctum saliens* to the eye. To which, in the following dayes, a certain gelly, like a litle worm, in the form of a *Mazot*, is adjoined, (as being the first platform of

the future *body*) divided into two parts; of one part whereof the *Trunk* is constituted, & the *Head* of the other: in the very same manner, as hath been formerly delivered in the History of the *Hen-egg*. The *Spine* of the *Back* is a little inflected in manner of a *Keel*; the *Head* is imperfectly composed of three small *vesicles*, or *little balls*, and swimming in the *Crystalline water*, doth dayly enlarge, and grow into shape: With this difference onely, that the *Eyes* are much larger, and more visible in *Oviparous*, then in *Viviparous productions*.

After the fix and twentieth day of *November*, the *fetus* is discerned, having his whole *body* almost compleat, being found without distinction, sometimes seated in the *Right*, and sometimes in the *Left horn* of the *Vterus*: but where there is a *Twin-fetus*, there is one of them placed in each of the *Horns*.

And at this time the *Male* is distinguishable from the *Female* by his *Genital parts*; which are conspicuous in a humane *Embryo*, so soon as ever the *rough Artery* doth appear.

You shall finde the *Male* and *Female* sometimes in the *Right*, and sometimes in the *Left horn*, merely as it falleth out. But yet the *Male* is more frequently discovered in the *Left*, and the *Female* in the *Right horn*, and this frequently in *Doves*, which have *Twins* within them, and I once also observed it in an *Ewe*. Whence I am confirmed, that the proper constitution, or peculiar virtue of either *side*, doth signifie nothing to the *discrimination* of the *Sex*. Nor is the *uterus* the *Fabricatour* or former of the *Fetus*, no, nor the mother her self, any more then the *Hen* is the framer of the *Chicken* in the *Egge* whereon she sitteth. But as the *Chicken* is made in the *Egge* by an *internal formative Agent*,
so

so likewise is the *fetus* constituted out of this *Egge* of the *Doe*.

A man would admire to see the *Fetus* formed and compleated in the *Amnion*, in so small a time after the first rise and beginning of the *Blood* and *Punctum saliens*. For about the nineteenth or twentieth day of *November*, that *Point* makes his first appearance: about the one and twentieth or two and twentieth day, the little unshapen *Worme* or *Maggot* discovers it self: but within six or seven daies after that, the *Fetus* is so compleat, that you may distinguish the *Male* from the *Female*, (by the *Genital parts*) and perceive the *feet* formed, and the little *hooves* cleft, being then like *Gelly*, something inclining to yellow.

So soon as ever the *fetus* begins to be formed and grow, the substance of the *Uterus* is much extenuated: contrary to the custom of it in *Women*, whose *Womb* according to the increase of the *Fetus* becomes thicker, and more fleshy. For in *Hinds*, and *Does*, how much the more the *fetus* augmenteth, so much the *Hornes* of the *Uterus* approach neerer to the shape of the *Guts*: and chiefly that *Horne*, wherein the *Fetus* doth reside, doth resemble a little *wallet*, though in its extent and capacity it exceed the other.

This *Egge* or *Conception*, doth as yet on no side adhere, or grow fast to the *Matrix* (though the *fetus* is now compleat) but may bee very easily drawn away whole; as I have tried it in an *Ewe*, which bore a *fetus* in her *Womb*, almost the length of my *Thumb*. Wherefore it is most apparent, that the *fetus* is yet onely nourished by the *White*, which is shut up with it in the *Conception*, as it hath been observed in the *Hen-egge* before; for the *Orifices* of the *Umbilical Vessels* are quite obliterated

terated between the *White* of the *Conception*, and the adjacent *humours* with their *membranes*; not being any where as yet fastned to the *Uterus* it self, though those *Veins* or *Vessels* onely are the convoy to administer nourishment to the *fetus*. And as in an *Egge* the *propagations* of the *Veins* are first disseminated into the *Colliquamentum*; (as the roots of plants are into the ground) and are afterwards communicated to the *exteriour Membrane* (called the *Chorion*) and do dispatch their *branches* up and down with innumerable *divarications* through the *albugineous humour* contained in the utmost membrane, that so they may forage, and provide *Aliment*: so likewise in *humane abortions*, I have plainly discovered the *vein* in the *Chorion*; and *Aristotle* himself affirmed, that that coat was full of *veins*.

Hist. an. l.
7. c. 7.

If there be a single *fetus*, the *distribution* of its *Umbilical vessels* is extended to both the *Hornes* of the *Womb* (having little *branches* disseminated through the *cavity* thereof) that so it may attract *aliment* on both sides. But if there be two (namely one in each *Horne*) they both shoot forth their *Umbilical propagations* into that part onely of the *Conception* which borders upon their proper *Horn*: so that the *fetus* seated in the right *Horne* deriveth his sustenance from the right side of the *conception*, and he in the left from the left onely: The *Gemellicfical conception* being in all other matters also like the *Gemellicfical Egge*.

Now, about the end of *November*, all the parts are clear and distinct, and the *fetus* now appears of the magnitude of a large *Beane*, or a *Nutmeg*: the hinder part of his *Head* being a little prominent, as it is in a *Chicken*, but his *Eyes* are less. His *Mouth* lies gaping wide even from *Ear* to *Ear*:
for

for the Cheeks and Lips are last of all perfected, as being *cutaneous parts*. So that in all Productions (even in *humane* also) the slit of the Mouth is dilated as far as the Ears on both sides, having neither Lips nor Cheeks to abate it. And for this cause, as I conceive, many are born with *cleft lips*, (we call them *Hare-lips*, that is, having such lips as *Hares*, and *Ganels* have) because in the formation of the *humane* fetus, the upper lips do very slowly close.

I have often times cast the fetus, when it was now grown to the quantity of a fair Bean, being transparent under his coat *Aminios*, and swimming in his most pure *aliment*, into a silver basin full of the clearest water, whereby I discovered chiefly these most remarkable following things. His brain being of a little thicker consistence then the *White* of an Egg, (like *milk* a little coagulated) of a rude shape, lieth encompassed on every side in a membrane, having as yet no *skull* at all. The *After-brain* stands up something prominent, as in a *Chicken*. The *Cone* or whole frame of the Heart looks white, and so also all the other Bowels (even the *Liver* it self) are white, and as it were *spermatical*. The *Trunk* of the *Umbilical Vessels* doth arise from the heart, and passing the gibbous part of the *Liver*, doth insert it self into the *Trunk* of the *Vena Porta*, or Gate Vein; and running thence a little farther, and distinguishing it self into several *propagations*, it is diffused through the *colliquamentum*, and the coat called *Chorion*, by an infinite number of branches. The *Sides* on both hands arise from the spine, so that the *Thorax* or chest looks like a boat, or little *pinnace*, before the Heart and Lungs are retired into its *cavitate*: just in like manner as it is in the *chicken*. For the Guts, Heart, and the rest
of

of the Bowels are very conspicuous, and seem to be little *appendixes* of the body; untill at last the chest and coverture of the *lower Belly* are drawn over them (as the *Koofe* is erected upon the open *roomes*) and so veil and conceal them. At that time the sides as well of the Breast; as the Loines, seem to be *white, mucilagineous*, and of a *similar constitution*, excepting onely that through the inside of the Breast, some certain slender *capillary lines* do run along, and so occasion a distinction between the future *Ribs*, and the *carneous* or fleshy parts of the sides.

I have also sometimes seen the *Twinne-fetus* in the Conceptions of *Ewes*, which have been about the same time wherof we now speak (and sometimes one alone) which were of the longitude of a *transverse finger*: their form was like that of the smallest *Lizard*, and their *magnitude* like that of a *Wasp*, or *Worm* called *Eruca*: the *Spine* of the back was bent round, so that the head did almost reach to the *taile*. Both of them did swim in a peculiar clear *humour* of their own, inclosed within the *Amnion*: and both were of the same magnitude, (as if they had been begotten at one and the same act of *cōition* and *cōception*) For though the one lay in the *right*, and the other in the *left Horn*, yet both were included in the same *wallet*, and in the same *exteriour water*: (and so consequently in the same *egge*, or *cōception*.) Their *mouthes* were wide, but their *eyes* were small, and scarce discernable *points*; contrary to those of *Birds*. Their *Bowels* or *Intrals* also were not as yet inclosed within the *cavity* of the body, but were hanging out. Their *Exteriour Membrane* called *Chorion*, did not adhere to the *Uterus*, so that I could not take away the *cōception* whole & entire.

ure. There were also in the same coat an infinite number of *Umbilical propagations* which had no connexion at all to the *Uterus*: as we have noted in *Deer* also, and after the same manner, as we have described them in the *outward membrane* of the *Hen-egge*. There were onely present two *humours*, and as many coats containing them: whereof the *exteriour* called *Chorion*, was extended over both the *Horns*, and being full of a more turbid humour, did fashion or shape the *egge*, or *conception*. But the coat called *Amnios*, was almost invisible (like that coat of the *Eye* which is called *Arachnoides*, or the *Cobweb*, being the *membrane* of the *Crystalline humour*) containing in it a clear bright *Water* like *Crystal*, wherein this *fetus* of the *Ewe* did swim.

The *humour* contained within the *Chorion*, was in proportion a hundred times more (I might say a thousand) then the other, though the *Crystalline humour* too which is reserved in the *Amnios*, was in a larger quantity, then to be suspected for the *Sweat* of so small a *fetus* swimming amidst it. Nor was it of any distastful *savour*, or *scent*, but exceeding clear: and (as we have noted in *Hinds* and *Does*) resembling thinne watry milk, being tainted with no kinde of *excrementitious* pravity. Now in case this *humour* were an *Excrement*, it would also grow and encrease as the *fetus* it self doth: But I finde the matter clean contrary in the *fetus* of the *Ewe* also; for a litle before it is eaned, there is scarce any portion of this *humour* left. Wherefore I conceive it rather to be the *Aliment*, then the *Excrement* of the *Fetus*.

The *Interiour* coat of the *Ewes womb* was imbossed with an infinite number of *caruncles*, (as the *skie* is with *starres*) which were of the likeness of
Crab;

Crabbs eyes, as I call them, but something less; and resembling loose or hanging *warts*, were *glandulous*, and *white*, sticking within the *coats* of the *womb*, being something *hollow* or excavated on that *side* wherewith they incline towards the *Conception*: (contrary to their course in *Hinds* and *Does*, in which they do extubérate towards the *Fetus* it self) and besides all this, they did strut with *blood*, and their interior *superficies*, as it did direct it self towards the *conception*, was full of black, sanguineous *points*. The *Umbilical Vessels* of the *Fetus* were not as yet inserted into these *caruncles*, nor was the *conception* hither-to fastened to the *Uterus*.

As for that *coat*, which they talk much of, and call *Allantsides*, I can finde no such matter in the *conceptions* of *Ewes*; but afterwards (when the *fetus* is now grown bigger) when the *Egge* or *Conception* doth now cleave to the *Uterus*, and the *veins* are inserted into the *caruncles*, then is the *Chorion* extended farther, and in its two *ends* (or *Appendixes* as it were) a certain *humour* died yellow (you would conceive it to be an *excrementitious humour*) is secluded, and reserved apart from the rest.

As for a *Humane Conception*, that hardly differs any thing from an *Egg*, for the first *moneths*. For before the *After-birth* or *Uterine cake* hath been framed, I have seen a *white humour* (like to the thinner *Wbite* of the *Egge*, and equal in magnitude to a *Pigeons egge*, nay sometimes to a *Pheasants*) encompassed in a slender *membrane*; wherein the *Embryo*, who was as long as the *nail* of the *little finger*, did appear like a small *frogge*: having a *broad body*, a *wide mouth*, and his *armes* and *leggs* newly shot forth, like the young *buds* of *flowers*:
he

he had a prominent *Occiput*, or *After-braine*, which may be rather called a *little bladder* annexed like an *appendix* to the rest of the *head*, as hath been mentioned in the first *rudiment* of the *Occiput* of *chickens*.

An other *humane Conception* I saw (which was about fifty dayes standing) wherein was an *egge*, as large as an *Hen-egg*, or *Turkey-egg*. The *fetus* was of the longitude of a *large Bean*, with a very great *head*, which was over-looked by the *Occiput*, as by a *crest*; the *Brain* it self was in substance like *Coagulated milk*; and instead of a *solid skull*, there was a kind of *Leather-membrane*, which was in some parts like a *gristle*, distributed from the *fore-head*, to the *Roots* of the *Nose*. The *Face* appeared like a *Dogs snout*. Without both *Ears*, and *Nose*. Yet was the *rough Artery*, which descends into the *Lungs*, and the first *rudiment* of the *Yard*, visible. The two *deaf-ears* of the *Heart*, appeared like two *black eyes*.

In a *Woman with childe*, who dyed of a *Feaver*, I found an *Hermaphrodite Embryo* of almost the same bigness. Its *Privity* was like that of a *Cony*, the *labra* resembling the *prepuce*; and the *Nympha*, the *Glaus* or *Nut*. Above this *privity* I saw the first *rudiments* of a *Yard*, to which there hung down on both *Sides*, instead of *Testicles*, the *laxe* or *flaggy skin* of the *Scrotum*, or *Cod*. Its *Uterus* or *womb*, was very litle, resembling the *Uterus* of an aborted *Lamb*, or *Molt*, having both the *Horns*. And as the *Glandules* or *Kernels*, called *Prostate*, were situate near the *Yard*, so also were the *Testicles*, which were of a discernable magnitude, placed next to those *Horns*. So that, according to outward appearance, it did most expresse a *Male childe*, but upon inward discovery of the *Parts*, a *Female*.

The

The *womb* of the *woman* that bare it, was very vast, having the *bladder of Urine* adjoined to it (as its *Appendix* :) but contrariwise in the *Fetus*, the *Bladder of Urine* was large, and the *Uterus* looked onely like its *Appendix*.

All these fore-mentioned *humane Conceptions*, like the *Ewes*, had a rough or wrinkled *superficies* outwardly, and were dawbed over with a kinde of *Gelly*, or *glutinous substance*; and at that time, there was neither any appearance of the *After-burden*, nor yet any union of the *Conception* to the *matrix*, nor any insertion of the *Umbilical Vessels* into the *matrix*, or *womb*, though they were disseminated into the *superficies* of the *Conception*.

Though diverse *fetus* are sometimes found in the same *Conception* of *Hindes*, and *Does*, (as diverse *Chickens* in the same *white* of a *gemellifical Egg*) as it also happeneth in *Ewes*, *she-Goats*, and other cloven footed creatures : yet in *Bitches*, *Conies*, *Sowes*, and other *Viviparous* and *Multiparous Animals*, the matter is clean otherwise; for every *fetus* in them doth challenge *two several humors*, and *two distinct coats*.

In *Bitches* there are several *Knots* through the whole *cavity* of the *Horns* of their *uterus*, in which so many *several humors* are contained, and in every one of them a *several Fetus*. In the *Hare*, and *Cony* which are *Does*, you may perceive many round *gobbets* or *balls* (such as the *eggs* of *Serpents* are) like *bracelets* made of several *Amber beads*.

The *Hares Conception* is exceeding like an *Acorn*, and the *After-burden* covereth it in manner of a *Cup*; and the *Humours* contained in the *membranes* hang down like little *Acorns*.

Of the manner how the Conception of
Hindes, and Does, is found to
be in the month of De-
cember.

EXER. LXX.

IN the beginning of *December*, the *Fetus* is now more grown and perfect, being of a fingers length. The *Heart*, and other *Bowels*, together with the *Guts* (all which were formerly exposed to publick view) are retreated into the hollow of the *body*; so that you can neither discern them, nor the motion of the *Heart*, without dissection.

The *Conception* or *Egge*, by the mediation of the five *Caruncles* in each *Horn*, (formerly spoken of) is in five several places adjoined and fastned to the *Uterus*, yet not so firmly neither, but that a small force will disjoin them again. Which being done, you shal discern the different print of the *Caruncles* in the outward *superficies* of the *Chorion*, by which *Caruncles* it was united to the *Uterus*, the impression which they leave behinde them being rugged and viscous, as if by that glew or paste, the said adhesion or conjunction had been effected. And thus have we revealed the *Nature* and *use* of these *Caruncles*; for they which before (like *Warts* or *Mushrooms*) were bred at the *sides* of the *Uterus*, do now, being knit to the *conception*, supply the place and office of an *After-burden*, or *Uterine Cake* (as it is in *Women*) namely, they are instead of so many nipples from which the *fetus* by the assistance of his

F f Umbilical

434 Ex.LXIX. *Of the manner of the*

Umbilical Vessels doth derive to himself such *Aliment* as his Mother affords him : as shall appear hereafter.

The *Magnitude* and *capacity* of the *Vterus* (under which name we understand the *Hornes* of the *Vterus* ; namely the places of *conception*) do enlarge according to the growth of the *fetus*, but yet so, that, that *Horn* wherein the *fetus* seileth his abode, is larger then the other.

Their *conception* or *egge* is one onely ; whether they produce a single, or diverse *Fetus* : and that single *conception* is dilated over both the *Horns* ; so that it looks like a brace of *puddings*, or rather like one onely, and that tied in the middle, as hath been formerly said : for passing along slender, and round, from the farthest part of the *Horne* on one side, it doth by degrees enlarge, and so goeth on to that common place, which in a Woman we call the *Womb* and *Matrix* or Mother ; (because a *Woman* in that part is made a Mother, by conceiving and fostering a *fetus* in it) where it is streightned as if it passed through an *Isthmus* ; and being again dilated, as it arriveth at the other *Horn*, it proceedeth still on to the farthest extremity thereof likewise ; where growing less, and pointed (as it did at the beginning) it erects its *non Ultra*, and proceeds no farther. Therefore these kind of *conceptions*, if they be drawn away entire, do resemble a *wallet* whose both ends are full of *Water* : and thence also that *coat chorion*, is likewise called *Allantoides* ; because the *conceptions* of such Animals resemble a *Gut* blown up, or *stuffed pudding*, which is tied fast in the midst.

If you dissect an *Embryo* at this time, you shall discern all the interiour parts distinct, and compleat : but chiefly the *Stomack*, the *Heart*, and
Kidney,

Kidnies, and the *Lungs*; which are also divided into their *Lobes*, and look as they had blood in them, having gained their just form. But the complexion of these *Lungs* is more ruddy, then of those which have at any time breathed; because the *Lungs* stretched and dilated by the *Air*, put on a whiter colour. And by this observation of the different complexion, [you may discover whether a Mother brought her Childe alive or dead into the world; for instantly after inspiration the *Lungs* change colour: which colour remains, though the *fetus* dye immediatly after.

In a *Female fetus*, the *Testicles* (improperly so called) are seated neer the *Kidnies*, in the hanging or loose ligament of the *uterus*, or *womb*, at the ends or extremities of the *Horns* on both sides; and are for their proportion larger in a *fatus*, then in a grown body, and look white, like the *caruncles*.

In the *Stomack* of the *Fatus*, there is found a watery substance, (not unlike that wherein he (swims) but something more troubled, and less transparent: like to that *milk* which is dreined out of *Womens breasts*, that are about four or five moneths gone, or like *white Posset* as we call it.

In the *upper Guts* there is store of *chyle* made of the fore-said substance now concocted. But in the *Colon* or *colick Gut* there do begin to appear yellow excrements, and shaped.

But as for the *Urachus* (or Perforation of the *Navel* of the *fatus*, by which it is imagined to discharge the *urine* into the coat called *Allantoides*) I finde no such matter; nor any difference at all between the coat *Allantoides* (which is supposed to contain the *urine*) and the *Chorion*; nor do I discover any *urine* in the *After-birth*, but onely in the

Bladder, and in that, good store: the Bladder itself, being something *Oblong*, is scituate between the *Umbilical Arteries*, which arise from the *branches* of the descending *Trunk* of the *Great Arterie*.

The *Liver* is rude, and almost inform or unshapen, as if it were something besides Nature's intention, it looks onely like a *ruddy affusion* of *Blood*. The *Brain* being now somewhat reduced into shape, is comprehended in a *thick membrane*. The *Eyes* lie concealed under the *lids*; and those *lids* are so starched together, and shut so fast (as it is with *puppies* newly *whelped*) that I had much ado to disjoin them, and open the *eyes*. The *Breast-bone* and *Ribs* do now harden by degrees: and the complexion of the *Muscles* shifts from *white*, to be *blood coloured*.

Having made very many several *dissections* for the whole course of this Moneth, I am become more assured, that the *caruncles* before mentioned, do exercise the office of an *After-birth* or *Uterine cake*; which I now discerned to be *red* and *swelled*, and about the bigness of a *Wall-nut*. The *Conception*, which, as we said, did before stick only to the *caruncles* by the help of the glutinous substance, doth now dispatch the *little branches* of the *Umbilical Vessels* into the very body of the *caruncles* (as *Plants* work in their *Roots* into the *earth*) by which it is fastened, and grows to the *Womb*.

About the end of *December* I have seen the *fetus* being then about a *span* long, lustily bestirring himself, and kicking; opening his *mouth* and *jawes*, and also shutting them again. His *heart* was now placed in its *purse*, or *pericardium*, and the *Breast* being dissected, it was very discernable making apparent and forcible *Palpitations*; and

yet the *Ventricles* of the *Heart* were *Vniforme*, and of equal magnitude, and did consist of equal height, or of a double cone: the thickness also of their sides was equal. Where also I clearly discerned the *deaf ears* of the *Heart*, which at this time were full of blood, like two pretty large *bladders*, to continue and persist in their motion for a little space, even when the *Heart* it self had resigned it up.

All the *Bowels*, which were indeed perfect before, are now larger and more conspicuous. The *Skull* is partly *cartilagineous*, and partly *bony*. The *Hoofs* are yellowish, flexile, and soft (just as the *Hoofs* of grown *Deere* are, being mollified in seething water) the *Caruncles*, now very great, (as large *Mushroomes*) are spread over the whole cavity of the *Uterus*, and do evidently supply the use of an *After-birth*: for several propagations and those large ones too, are from the *Umbilical Vessels* disseminated into them, that so they may derive aliment to the *fetus*: in like manner as in those that are already in the world, the *chyle* is transported by the *Meseraick* branches into the *Gate vein* of the *Liver*.

In whatsoever *Conception* of this kind, there is but one onely *fetus*, there the *Umbilical vessels* are conveyed to all the *caruncles*: (as well of the opposite, as the same side) but in that conception where there is a double *fetus*, there the *ramifications* of the *Umbilical vessels* relating to each *fetus*, are not propagated beyond the *caruncles* of the same side wherein it resideth.

The *lesser Umbilical veins* as they respect the *fetus*, do where they unite and join together determine and end in other greater *Veins*; and those again passing farther on, and uniting, do conclude

in Veins yet greater then themselves, till at the last they constitute two *trunks*, which being conjoined, do convey *Blood* into the *Hollow*, and *Gate Vein*. But the *Vmbilical Arteries* (arising from the branches of the *descending Trunk* of the great *Artery*.) are two, and those very *small* ones, and such as were it not for their *pulse*, could scarce be discerned, which being carried along, to the capacity or superficies of the *conception*) where the *caruncles* or *After-birth* meet the *propagations* of the *Veins*) do first diminish or lessen into *capillary threads*, and at last become quite invisible, and are clean expunged.

As in the *Vterus* the *Extremities* of the *Vmbilical vessels* are terminated into the *caruncles*, so likewise out of the *Vterus*, the *Vterine vessels* (which are many, and large) carrying *blood* from the *Mother* to the *Womb* (by the conduct of the *suspensory ligaments*) do terminate outwardly in those very *caruncles*. We are also to take notice, that the *Interiour vessels*, are all of them *Veins*, for the most part: but the *Exteriour* are for the most the *propagations* of *Arteries*. In the *Womans After-burden*, if you mind it well, presently after she is delivered, are many more *Arteries* then *Veins*, and also larger too, which are disseminated with almost innumerable *propagations* up and down, even to its utmost *superficies*. As also in the fungous *Parenchyma*, or *Affusion* of the *Spleen*, which is not unlike it, the number of the *Arteries* exceedeth that of the *Veins*.

The *exteriour Vterine vessels* do, as I say, tend towards the *Matrix*, and towards the *Testicles*, which are seated in the *suspensory ligament*; as some men imagine.

In the *Gibbous* or *convex* part of the *caruncles*,
which

which respect the *Matrix*, I have observed a wonderful contrivance in *Nature*: For in diverse of the Cavities, and *Cotyledones*, or Orifices of the vessels gaping outwards, I found a *white mucilaginous substance*, which did fill up the *whole body* of the *caruncle*, (as the *Honey* stuffs up the *Honey-comb*) and was of a complexion, consistence, and tast much like the *White* of an *Egge*. But if you pluck a sunder the *conception* from the *caruncles*, you shall presently descry so many *spriggs*, or *capillary branches* of the *Vmbilical* vessels (which look like long threads or filaments) to be drawn out also from every one of the *Cotyledones*, and Combs as it were, and out of their *mucons substance*: just as Herbs plucked up from the Earth, have their Roots trailing after them.

By which it is evident, that the Extremities of the *Vmbilical* vessels, are no way conjoined to the *Vterine* vessels by an *Anastomosis*; nor do extract blood from them, but are terminated in that *white mucilaginous matter*, and are quite obliterated in it, attracting nourishment from it; after the self same manner, as they did formerly draw *Aliment* from the *white moisture* or *sap*, which was concluded within the membranes of the *conception*. And as the *chicken* in the *Hen-egge* is sustained by the *White* attracted by its *Vmbilical* vessels; so the *Conception* also of Hinds and Does, is nourished with a *white substance* like to that, which is stored up in these litle Cells, and not with *blood*.

Wherefore these Caruncles may be justly stiled the *Vterine cakes*, or *dugs*: that is to say, Convenient and proportionate Organs or Instruments designed for the concocting of that Albuginous Aliment, and for preparing it for the attraction of the Veins. And therefore those Viviparous A-

nimals which have not these Caruncles or After-birth ; (as the *Mare*, and the *Sow* have none) their *fetus* is sustained even till the hour of their *birth*, with the humours which are contained in the Conception onely ; and their conception doth where adhere or grow to the *Vterus*.

It is therefore manifest in those, and also in these sorts or species of Viviparous Animals, (and perhaps in all other whatsoever;) that the *Embryo* is in no other manner sustained in the *Vterus*, then the *chicken* in the *Egge* ; but out of the same Nutritive substance, and of like kind to the *Aliment* in the *White* of an *Egge*. For as in an *Egge*, the extremities of the *Vmbilical* vessels are terminated in the *White* and *Yolk* : so likewise in Hinds and Does, and other Animals, that are furnished with these Caruncles, the extremity of the Orifices of the *Vmbilical* vessels are opened into, & terminated in the humour which is contained in the Conception ; and in that white substance, which is found in those Orifices or *Cotyledones*.

And this truth is hence also asserted, in that the extremities of the threads or filaments of the *Vmbilical* vessels, when they are drawn out of that mucous or *white substance*, are all of them white likewise ; which is a forcible argument they do onely imbibe this gelly or *mucilage*, and not *blood*. And any man may prove the same Experiment in an *Egge* also, if he desire it.

The *After-burden*, or *Vterine cake* of a Woman, is in its *gibbous* part, wherewith it respects the *Womb*, uneven, & hilly, by reason of several tumors or mushroom-like substances ; and seems by their mediation to grow to the *Womb*. As if it were not fastned to the womb in every part, but onely in those places, where the vessels disseminated into

it

it do extract *Aliment*, and in which for that cause, the *extremities* of the *vessels* are broken off. Now whether those *extremities* or *terminations* of the *vessels* do suck blood from the *Womb*, or rather some kind of concocted substance like to the *White* of an *Egge*, such as we perceive plainly in *Hinds*, and *Does*, I am not yet satisfied.

Lastly, (that the truth in hand may be certainly confirmed) if you squeeze those *caruncles* between your fingers; you may easily Milk as much of that *Nutritive juice* as a spoon can contain, out of any one of those *Caruncles*; (as out of a *Nipple*) without any appearance of *blood* at all; which blood you shall never squeeze from them though you force them never so much. Moreover, the *caruncle* thus milked & drained, doth contract it self, and flag, like to a *sponge* that is squeezed, and appears to be bored through with several *perforations*. So that by all signs and tokens it appears that those *Caruncles* are *Ubera Vterina*, the *Breasts* or *Vdders* of the *Uterus*, or the receptacles and store-houses of that *Nutritive white substance*.

At the end of *December*, these *Caruncles* do less firmly cleave to the *Vterus*, then they did before, and are with ease divided from it. And by how much the *fetus* doth improve, and grow neerer to the *birth*, so much the easier do these *caruncles* disjoin from the *Womb*: and in the end (as ripe fruit falls off from the *Tree*) they depart from the *Vterus* of their own accord, as being things which relate to the *conception*.

And when they are parted from the *Womb*, you may, in the impressions which they leave behind them, perceive the *points* or *terminations* of the *Arteries* which pass on towards them, breathing forth blood. But if you force the *conception* from
the

the *caruncles*, no blood doth issue out from the impressions which they leave behind them : though it do seem more consonant to reason, that blood should issue out of the *caruncles*, then of the *conception* upon their divorce. For since the *caruncles* are embroidered by several *propagations* of *Arteries* derived from the *Vterus* ; and are commonly conceived to convey blood for the *nutriment* of the *Fetus*, they ought in consequence to abound with plenty of *Blood*. And yet though you milk or compress them, they effund no blood at all ; because they are not ful of blood, but of this *white substance* ; nor do they seem to be instruments instituted for the concoction of the former, but *Promptuaries*, or *Treasuries* of the latter. By which it is apparent, that the *fetus* in the *Womb*, is not sustained by the *Mother's blood*, but by this *white substance* fitly prepared. And perhaps even grown bodies are not nourished by *blood*, but something which runs in the *blood*, is their common and last *Aliment* : as shall perhaps be elsewhere discovered in our *Physiological Treatise*, and in the proper disceptation relating to the blood.

L. de nat.
Mul. de
morb. vulg.
Et Sect. 5.
Et aphor.
45.

I do much question the truth of that place of *Hippocrates*, where he saith : *Those Animals whose Acetabula or Orifices of their Vterine vessels are full of a mucons substance, do suffer Abortment.* For that substance is not an *Excrement*, and cause of *Abortion*, but an *Aliment* and first cause of *life*. But *Hippocrates* perhaps meant some other *Acetabula* : for in a *Woman* they are not found, nor hath her *After-birth* any such substance as this to be sensibly perceived in any of its *cavities*.

The Later *Physitians*, according to the opinion of the *Arabians*, do phansie three several *Nutritive Humours* ; namely, *Rorem*, the dewy substance

stance, *Gluten*, the glutinous substance, and *Cambium*, the substance which is immediately transformed into the essence of the parts: and these *Fernelius* calls *succos Nutritios*, the alible juices; as conceiving, that the Parts of our *bodies* are not immediatly nourished by the *Blood*, as its last aliment, but by these *secundary humours*: by the first whereof, as by a kind of Dew, all the smallest particles of the *body* and parts thereof, are sprinkled and bedewed; which *humour* being thickned by a farther *concoction*, and sticking more firmly to the Parts, is now called *Gluten*, which at last being altered and assimilated by the power and virtue of the Parts, is called *Cambium*.

We may, according to these Mens conceit, call that substance which we finde in the *Acetabula*, or *Orifices* of the *vessels*, the *Gluten*, or *Nutritive white*, and say that it is (as being the last Aliment which is designed to all the several parts of the *fetus*) proportionable to the *White* or *Yolk* of the *Egge*. For as we said ere-while, with *Aristotle*, that the *Yolk* is proportionable to *milk*: so we likewise conceive it consonant to reason, to affirm, that this substance, which is contained in the *Cotyledones*, or *Acetabula* of the *Uterine cake*, doth supply the office of *milk* to the *fetus*, so long as it continues in the *womb*: and consequently, that the *Carruncles* are as it were *Ubera interna*, internal Dugs, and that the *alible juice* is (after the delivery) transported into the *Breasts*, and there made *milk*; that so the *fetus* may enjoy the same nutriment after he is born, wherewith he was fed when he continued in the *womb*. And therefore this onely difference is between the party-coloured Eggs of *Oviparous Animals* (which are compounded of the *Yolk* and *White*) and the Eggs or Conceptions of
Vivi-

Viviparous Animals, that in the former, the *Yolk* (which is their *secondary sustenance*) is provided for them within the Egg, and presently upon their Exclusion, is shut up within the belly of the *Chicken*, as being reserved there for their support; but in the latter, this *nutritive substance* is before the Birth preserved in the *Acetabula*, and after the Birth transmitted to the *Breasts* or *Udder*. So that the *Pullus* is supplied with a kinde of *milke*, which is concluded in it self; but the *Viviparous fetus*, sucks the same from the duggs of the *Dam*.

When *December* is ended, seeing that in the subsequent moneths of *January*, *February*, &c. there is nothing new or notable doth befall the *fetus*, but all its accessions have been observed already, (save onely the *Hair*, *Teeth*, *Horns*, and the like) only the parts formerly described seem to have attained a larger Augmentation, little or nothing respecting the business of Generation, we conceive it useless to discourse any more of them at present.

But as to the Conceptions of *Ewes*, I have dissected divers of them about this time, which (like those of *Does*) did also resemble the figure of a *Wullet*, or *double-pudding*, being extended over both the Horns of the *Womb*. In some of these Conceptions I found two *fetus*; in other, one only, and that void of all kinde of *wool*, with its eyes so congealed and fixed together, that I could not open the *lids*, and yet the *hairs* were already made. Where there were two *fetus*, they lay in several Horns of the *Uterus*, and that promiscuously, without any order at all observed, the *male* being sometimes in the *left*, and the *female* in the *right Horn*, and sometimes clean contrary: but both were still encompassed in the same common Conception,

Conception, and concluded in the same *exteriour membrane* called *Chorion*; whose *Extremities* or ends on both *Sides* towards the termination of the *Horns*, were stained as it were by a kinde of *cholericall excrement*, and did seem to have some turbid and excrementitious matter within them.

The *Caruncles*, or little *Cakes*, were diverse, and of a different *magnitude*, and of a distinct *figure* from the *caruncles* of *Hinds* and *Does*: for in *Ewes*, there is a kind of round *mushroom* with the stalk broken off, contained between the *Coats* of the *Uterus*, whose gibbous Part lieth towards the *Uterus*; (as it is also in the *Conceptions* of *Cowes*) but the *concave* (which is smooth) towards the *fetus*: and likewise larger *Branches* or *Vessels* are derived to this *concave part*, as it also happens to the *interiour part* of a *Womans After-burden*.

The *Propagations* of the *Umbilical Vessels* being annexed to the *caruncles*, do grow so firmly to them, that when I endeavoured to divide them, the *gibbous part* would be sooner broken off from the *interiour coat* of the *Womb*, then recede from the *Conception*: contrary to their custom in *Hinds* and *Does*, whose *membrane* called *Chorion*, is easily separated from the *Cotylidones* of the *caruncles*; and the *convexe side* of the *caruncles*, which adhereth to the *Conception*, may be divided from it; but the *Concave part*, or root rather, or stalk, sticketh fast to the *Uterus*. But in other matters, the office is alike in all, and they have the like *Acetabula*, and an *Albugineous gelly* may in like manner be milked out of them, as out of these *caruncles* of *Cowes* also.

Where there is but one single *fetus* in a *Conception*, there that *fetus* doth transmit his *Umbilical Vessels* to all the *caruncles* of both the *Horns* of the

the *womb*, that so he may derive nutriment from both. But that Horn wherein the *fetus* himself (swimming in the *crystal water* which lies within the *coat* called *Amnion*) doth reside, is larger then the other. But where there are two *fatus* in one and the same Conception, there each of them are confined to their proper *caruncles*, and do transmit their *Umbilical Vessels* into their own proper Horn only, and receive their Nutriment from thence.

If it be a *Male fetus*, the *Testicles* are large (for it's time) hanging without in the *Scrotum*. If an *Ewe-lamb*, the *Udder* hanging in the same place, hath litle *Tets* or *Nipples*, as *Womens Breasts*.

In the twofold *stomack* of the *fatus* (namely, the *Maw* and the *Dew-lap*) there appeared a *crystal water* like to that where he swam; for they did agree both in *colour*, *scent*, *taste*, and *consistence*: there was also in the *upper Guts* a substance like to *chyle*; in the *lower*, a green excrement, and dry dung, such as they use to eject when they graze: the *Liver* was something large, and the *Bladder of Gall* of an *oblong figure*, and in some of them it was quite empty.

But as to the order of the *production* of the *Parts*, we have still found the same to be observed in all *Viviparous Embryo's* whatsoever, as Experience hath revealed to us in that of the *Egge*, the *Hinde*, and the *Doe*.

Of the Innate Heat.

EXER. LXXI.

BECAUSE there is much talk of the *Calidum Innatum*, or Innate Heat, we do intend in this place (by way of second course, or addition) to discourse a while concerning both it, and the *Humidum Primigenium*, the Radical or Primigenial moisture; and that the rather, because I perceive many men to please themselves much with those two Notions, when as (according to my judgement) they do not understand their meaning. The truth is, there is no need at all to enquire after any kinde of *spirit* distinct from the *Blood* it self, or to introduce any forraign heat, or invoke the *Deities* to appear in the fable, and so trim up *Philosophie* with vain opinions and fictions; for what we commonly derive from the *Starres*, is bred and born at home, and within us. For the *Blood* alone is the true *Calidum Innatum*, or first-born *Animal heat*: as it is made apparent by our observations concerning the *Generation of Animals*; (especially of the *Chicken* out of the *Egge*) and therefore to multiply Entities, is meerly frivolous. For, indeed, there is nothing either before, or more excellent in the *Animal body*, then *Blood*; nor are those *spirits* which some men distinguish from *Blood*, any where to be found apart from the *blood*; and the *Blood* it self, without *spirit* and *heat*, is no longer to be called *Blood*, but *Gore*. The *Blood*, De part. an. l. 2 c. 3. saith *Aristotle*, is in a manner hot, and in such a manner, as it hath the essence of *Blood* in being hot: just as if we should express *Hot water* under one word: but yet

yet being considered as the subject of Heat, and such a substance, as when it is in being, is Blood, so it is not hot: for it is in some respect hot per se, or essentially, & in some respect it is not hot per se; for Heat is of its essence, as Whiteness is of the essence of a white man: but forasmuch as it is blood, in relation to Action or Passion, so it is not calidus per se, or essentially hot.

We Physicians call that *Spiritus*, a Spirit, which Hippocrates called *Impetum faciens*, that is, whatsoever doth attempt any thing *proprio conamine*, by its own proper endeavour, and doth set upon any action, or excite any motion with agility and vehemence: and under that capacity, the spirits of Wine, or of Vitriol, are called spirits. And hereupon Physitians count as many spirits, as principal parts, or operations; namely, *Animal*, *Vital*, *Natural*, *Visory*, *Auditory*, *Concoctive*, *Generative*, *Implanted*, *Influent Spirits*, &c. But the Blood (the primogenit and principal part of the Body) is furnished with all these respective qualities, and endowed with active power beyond all other parts of the body, and doth therefore deserve the name of a Spirit *κατ' ἔξοχον*.

Scaliger, Fernelius, & others, having not thoroughly considered the excellent endowments implanted in the Blood, have phansied other *Aerial* or *Ætherial* spirits, composed of an *Ætherial* and *Elementary substance*, to be a more excellent and diviner Innate heat than blood; which they conceited to be the most immediate instrument of the Soul, most proportionable to all its operations: grounding their opinion upon this opinion; namely, that the Blood (as being a substance compounded out of the Elements only) cannot perform any action beyond the sphere or activity of the Elements, and such bodies as are framed out of them. Hereupon they

they feigned a distinct spirit, and innate heat, which is of a celestial extract; namely, a most simple, most subtle, most thin, swift, lucid, and ætherial substance, partaking of a fifth essence. But yet they have no where demonstrated that there is any such substance, or that it doth act beyond the power of the Elements, or execute greater things then the Blood alone is able to accomplish. But we, who examine the nature of things according to sense, have never discovered any such substance. Nor are there in the Body any receptacles designed to the conservation, or generation of such matters, and they themselves also have not assigned any. *Fernelius*, indeed, saith, That whosoever hath not yet attained to the knowledge of the substance and condition of the Innate Heat, must first consider the structure of our bodies, and then address himself to the arteries which are seated in the cavity of the Heart, and to the Ventricles of the Braine; which when he shall discover void and empty, and without any humour contained therein, yet can be not imagine that such worthy matters are made by Nature rashly, and to no use: and upon this consideration, I conceive, he will presently conclude, that while the Animal was alive, they were replenished by some thin Aerial substance, which when the animal Soul departed, being exceeding light, did insensibly vanish. Now, to suppose this substance, the faculty of Inspiration is bestowed upon us, which doth not onely coole the body (for that might be derived to us by other meanes) but also administer a kinde of nourishment. But we affirm, that (so long as the Animal is alive) the Arteries & Ventricles of the Heart, are filled with blood; reputing the Ventricles of the Brain, to be too mean instruments for so noble a work, conceiving them rather allotted to the reception of excrements. For, what

shall we say of those several Animals, whose Brain hath no *Ventricles* at all? And though we should admit, that a kinde of *Aire* or *vapour* may be there found (because *Nature* doth decline a *vacuity*) yet that that substance is of a celestial extract, and heir apparent to such excellent performances, hath no semblance of truth at all. But that which we most admire, is, How this so exquisite, so divine a *Spirit*, should be sustained and fed by our common *elementary aire*? especially, since themselves assure us, that none of the *Elements* can perform any thing beyond their own abilities.

These men do likewise confess, that the spirit is in continual declension, and quickly dissipated, and corrupted, and that it could not subsist one moment of time, were it not repaired by the plentiful accession of outward aliment; and that therefore like the *Primum Vivens*, the first particle inspired with life, it must continually be fed. And now what need of this forraign guest, this *Innate Spirit*, or *etherial heat*? Since the *blood* is of ability to execute whatsoever is attributed thereunto; and since these spirits cannot recede from the *blood*, (without their dissolution) Nay they do not move any whither, or insinuate themselves into any part (as distinct bodies) without the company of the *blood*. For whether you conceive them to be framed, nourished, and increased out of the thinner part of the *blood*, (as some imagine) or out of the *primigenial moisture* (as others) yet all confess that they are no where to be found out of the *blood*, but that they continually cleave to the *blood*, as to their support (as the *flame* cleaveth to the *oyle* in the *lamp*.) And therefore their *tenacity*, *subtlety*, and *mobility*, &c. are of no more use then the *blood*, whose inseparable companions they

they are. So that the *blood* is sufficient, to become the proportionate and immediate instrument of the *Soul*; because it is every where present, and doth fly to and fro with an admirable agility. Nor are there any other bodies, or *spiritual incorporeal qualities*, or any *diviner heat* to be allowed of, (as *lux & lumen*, the Light, and Shine) as *Cesar* DiAsto. 7.
Cremoninus (a man excellently versed in *Aristotles* Philosophy) doth solidly contend against *Albertus*.

If these men pretend, that these *spirits* do reside in the *primigenial moisture*, as in the last *Aliment*, and from thence insinuate themselves into the whole body, thereby to nourish all the *parts*; they then conclude upon an impossibility, namely that the *Calidum Innatum* the Innate Heat, which is the *primigenial part* of the body (and stands it self in need of sustenance) doth nourish the *whole body*. For upon this account, the same thing is both the thing that is nourished, & also the thing by which it is nourished; and the self same substance, under the same respect, should both feed it self, and be fed also, which is indeed impossible: for in probability the thing which doth feed, and the thing which is fed, are not so much as mixed together: for miscible things must be of equal power, and operate one upon the other. And *Aristotles* position is, *Ubi nutritio, ibi nulla mistio est*, Where there is *Nutrition*, there is no *Mistion*. For where-soever *Nutrition* is, there the *Aliment* is one thing, and the thing nourished another; and a necessity of the transmutation of the one into the other.

But whereas they conceive that the *Spirits*, and the last or *primigenial Aliment*, or some other thing what ever it be in an *Animal*, can (more then the *blood*) operate above the power of the *Elements*; they seem not to understand what it is to operate

above the power of the Elements: nor do they rightly interpret that place of Aristotle, where he saith: Every vertue or faculty of the Soul, seemeth to partake of another substance, and that more divine, then those substances which are called Elements. And likewise where he saith, There is a certain thing in the seed of all things, causing them to be fruitful, which thing is called heat, which is not fire, nor no such faculty, but a spirit which is contained in the seed and frothy body, and the nature which is in that spirit is answerable in proportion to the Element of the Stars. For fire doth not generate any Animal, nor doth any thing seem to be constituted by thick, moist, or dry qualities. But the heat of the Sun, and of Animals, not that onely which is contained in the seed, but also whatsoever excrement there be, though of a different nature, yet even that also hath a vital principle. Wherefore it appeareth by what hath been said, that the heat contained in Animals, neither is it self fire, nor doth it take its original from fire. For I also do affirm the same of the Innate Heat, and of Blood, namely that they are not Fire, neither do they take their original from fire, but do partake of a different, and more divine substance then fire is, and therefore do not act by any elementary faculty; but as in the seed there is something which doth make it fruitful, and exceeds the vertues or powers of the Elements in constituting an Animal body; namely the spirit and the nature which is in that spirit, answerable in proportion to the element or substance of the Stars.

So likewise in the Blood, there is a spirit or vertue, which doth act above the power of Elements (most conspicuous in the nutrition or preservation of each particular part) and also a nature, nay a soul in that spirit and blood answerable in proportion

on to the *Element* of the *Stars*. And lastly, it is most evident, and my observations do plainly shew it, that there is a *Heat* in the *Blood* of *Animals* (whilest life continueth) which is neither fire, nor doth derive its original from fire.

But for the clearer illustration of these matters, give us leave to digress a while from our purpose, and declare briefly, *what a spirit is, and what it is to act above the power of Elements*, and likewise what is meant by these words, namely, *to partake of a different body, and that more divine, then those bodies which are called Elements*: as likewise what is that nature in that spirit which is answerable in proportion to the element or substance of the *Stars*. What a *Spirit*, and *Vital principle* is, we have partly spoken already, and shall now handle something more largely. There are three several (simple) bodies, which do chiefly seem to challenge the name, or function at least of a *spirit*; namely, the *Fire*, the *Aire*, and the *Water*; and every one of these doth seem to partake of a *life*, or other *body*, by reason of their perpetual motion and flux; (I mean) the *Flame*, the *Wind*, and the *Flood*. The *Flame* is the *Flux*, or *Stream* of *Fire*, the *Wind* of *Aire*, and the *Flood* of *Water*. *Flame* like an *Animal*, doth move it self, nourish, and increase it self, and is an *Embleme* of *humane life*. And therefore it is much used in *divine Ceremonies*: and was religiously kept (as a sacred thing) in the *Temples* dedicated to *Apollo*, and *Vesta*, by *Virgins*; and amongst the *Persians*, and diverse other *Nations*, it was from all *Antiquity* honoured with *divine worship*. As if *God* were more visible in *Fire*, and did converse with us, (as heretofore with *Moses*) out of the *Fire*. The *Air* also seems to merit the name of a *spirit* too, for a *spirit* is called *spiritus a spirando*,

De gen. an.
l. 4. c. ult.

Spirando, from breathing; and *Aristotle* confesseth in plain tearms, that there is a kind of life and death of *Winds*. And lastly, the Water of the Flood or River, is called *Viva*, living Water. Those three bodies therefore (in as much as they enjoy a kind of life) do seem to operate above the power of *Elements*, and so partake of a *diviner body* or *Substance*, and hereupon were by the *Heathen* ranked amongst the *gods*, who conceived that whatsoever did perform any eminent effects, which did surpasse the naked abilities of the *Elements*, those effects did proceed from some *diviner Agent*. As if it were the same thing, to act above the power of the *Elements*, and to partake of a more divine essence, which did not deduce it selfe from the *Elements*.

Thus in like manner the *Blood* doth act above the Power of the *Elements*, when now being the *Primogenite part*, and *Innate Heat* (as it is in the *Seed*, and in the *Spirit*) it doth constitute the other parts in order; and this with an *eminent providence* and *understanding*, acting in order to a certain end, as if it did exercise a kind of *Ratiocination* or *discourse*. For it doth not these offices as it is *Elementary*, and deriveth its original from *Fire*, but in as much as it is made the *Primigenial Heat*, and most immediate and convenient instrument of life it self, by being impowred by the *Plastical virtue*, and *function* of the *Vegetative soul*. *Αἷμα, τὸ ζῶν δὲ τῷ ἀνθρώπῳ*, the *Blood* is the *Vegetal part* of *Man*, saith *Suidas*, which is true also of all other *Animals*. And *Virgil* seemeth to have intended as much, where he saith :

Ex.LXXI. *Of the Innate Heat.*

455

— *Unâ eâdemq; viâ sanguisq; Animusq; sequuntur :* *Ænead.*
Both Soul and Blood
Stream in one Flood. *10.*

The Blood therefore is a *Spirit*, in regard of its excellent power and virtue ; and also *celestial*, because the Soul is an *Inne-mate* in that *spirit*, which Soul is of a nature answerable in proportion to the Element of the Stars ; that is, something which beareth an *Analogy* to the Heavens, as being the *Instrument* and *Deputy* of the Heavens.

And so in this manner, all *natural bodies* fall under a double consideration ; namely, as they are considered, in their private capacity, concluded within the *bounds* of their own proper nature ; or else, as they are the *Instruments* of a nobler *Agent*, and *superiour power*. For being considered in their own proper abilities, it is perhaps no question, but that being all subject to *generation* and *corruption* ; they do derive their original from the *Elements*, and act according to their rule : but being considered as they are the *Instruments* of a more *worthy Agent*, and regulated thereby, they do not now act of themselves, but by the guidance of another ; and thereupon seem to participate of another more *divine Essence*, and so exceed the power of the *Element*.

So likewise the heat of the blood is an *animal heat*, inasmuch as it is guided in its operations by the *soul* ; and also a *Celestial heat*, as being *subservient* to the Heavens ; and lastly, a *Divine heat*, in that it is the *Instrument* of *Almighty God* : as we have formerly said, where we also did demonstrate, that the *Male* and *Female*, are the *Instruments* of the *Sun*, the *Heavens*, and of *God himself*, as being *subservient* to the generation of *Animals*.

The *Inferiour World*, according to *Aristotle*, is so continuous to the *Superiour Orbes*, that all its motions and mutations do seem to borrow their original, and regulation from them. And truly In this World (which the Greeks call *κόσμος*, from the beauty of its order) the *Inferiour* and corruptible things are subservient to the superior and incorruptible: and yet they all are obedient to the will of the Almighty and Eternal Creator.

They therefore who conceive that in a body compounded of the *Elements*, it cannot act beyond the power of the *Elements*; except it do also participate of another more divine body; and upon that ground, do suppose those *Spirits* whereof they treat, to be constituted partly out of the *Elements*, and partly out of a certain *Æthereal* and *Celestial substance*, do seem to have built their reasons upon a very shallow foundation. For you can hardly finde out any *Elementary body*, which doth not in its actions surpass its own proper power. Not to seek farre for an instance, which is every where obvious; the *Aire* and the *Water*, while they carry ships to the farthest *Indies*, and round the world; (and many times also into contrary parts) while they Grinde, Bake, Sift, drain deep Wells, cut Timber in sunder, kindle fires, bear up some things, and overwhelm others, and perform many other innumerable and wonderfull offices, do they not seem to act above the power of *Elements*? So also *Fire*; how many, and how strange employments doth it undergo? viz. In the *Kitchen*, and also in the *Shops* of such as deal in *Mettles*, and in the *Chymists* furnace, by *sublimation*, *fusion*, *concoction*, *corruption*, *coagulation*, and infinite other uses. What shall we say of it, when Iron it self is produced by its assistance,

quod

—quod terram domat, & quatit oppida bello?

Which tills the Field,

And makes Towns yeild.

When the *Load-stone* (to which *Thales* did therefore ascribe a *Soul*) draws *Iron* unto it, and that *Mettle* which subdueth all opposers, (as *Pliny* speaketh) pursueth after I know not what vanity; and the

Needle also being only touched by this *Loadstone*, doth still direct it self towards the *Poles* of the world. When our *Clocks* do faithfully strike all the *hours* both of *Day* and *Night*, do they not seem to partake of another Body, (besides the *Elements*) and that more *divine* then the *Elements*? Since then such excellent *Operations* are produced by the dominion and sway of *Art*; which operations do farre exceed the power of the *Materials* themselves; what shall we then think may be produced by the prescript and regiment of *Nature*, whom *Art* doth onely imitate? And if they effect such wonderfull things in obedience to *Men*, what performances may we expect from them, when they are *instruments* in the hands of *God* himself.

In short therefore, this distinction is necessary, namely, that no *Primary* or *first Agent*, doth act any thing beyond its own power: but every *Instrumental Agent*, doth exceed its own power; for it acts not onely by its own power, but also by the virtue of the *superiour efficient*.

They therefore which deny such eminent endowments to the *blood*, and flye up to Heaven to fetch down I know not what *Spirits*, to whom they may ascribe those *divine operations*: they do not know, or at least do not consider, that the work of *Generation* (and of *Nutrition* also, which is indeed a *Species* of *Generation*) for whose sake they

they attribute such notable prerogatives to those *Spirits*, doth much exceed the power of those *spirits* themselves: & not of those *spirits* only, but even of the *Vegetal Soul*, nay of the *Sensitive*, & in a word, of the *Rational soul* her self, and not the power only, but the very apprehension of the *Rational soul*; for the *Nature and Order of Generation*, is truly admirable and divine, beyond the comprehension and grasp of our thoughts, or understanding.

That it may therefore more clearly appear, that those eminent attributes which learned men bestow upon the *Spirits*, and the *Innate Heat*, do belong to the *blood* alone; These few following considerations do offer themselves, over and above those things, which are wonderfully evident in an *Egge* (before any rudiment of the *Chicken* appear) and also in a perfect and adult *Fetus*. Namely, that the *blood* being considered absolutely in it self out of the *Veins*, as it is an elementary substance, and composed of several parts (namely, of serous, thin, crass, and concrete parts) is called *Cruor*, *Gore*, and doth possess a few onely, and those obscure abilities. But being in the *veins*, as it is a part of the body, and that also an *Animate*, and *Genital part*, and the *Immediate Instrument*, and *primary seat of the soul*: and also as it seemeth to partake of another more *divine body*, and is inspired with a *divine animal heat*; it is then endowed with excellent abilities, and answerable in proportion to the *element of the Stars*. In as much as it is a *Spirit*, so it is the *Fire*, the *Vesta*, the *Household deity*, the *Calidum Innatum*, the *Sun of the Microcosme*, and *Platoes Fire*; not because (like ordinary fire) it *shineth*, *burneth*, and *destroyeth*: but because it doth *conserve*, *nourish*, and *increase it self*, by a free perpetuall motion. It doth

doth also challenge the name of *Spirit*, in as much as it doth primarily, and before the other parts, abound with *Radical moisture*, which is the last and neereſt aliment thereof, and doth diſpence and provide the ſame ſuſtenance for all the reſt of the parts; wherewith it ſelf is ſupported: namely while it doth nimbly dart it ſelf through the *whole body*, and nourish, cheriſh, and keep alive all the parts thereof, (which it ſelf doth firſt frame, and adjoin to it ſelf) after the ſame manner as the ſuperiour Orbes (but eſpecially the *Sun* and *Moon*) do, by their *continual motions*, quicken and preſerve the *inferiour world*.

Seeing therefore that the *Blood* doth aſt above the power of the *Elements*, and is inſpired with ſuch notable virtues, being alſo the *Instrument* of the *Omnipotent Agent*; no man can worthily magnific and extol its wonderful and divine faculties. In it the *soul* doth firſt, and principally reſide, and that not the *Vegetative ſoul* onely, but the *Senſitive* and *Motive* alſo; it penetrates every part, and is every where preſent; and that being taken away, the ſoul is preſently gone: ſo that the *blood* ſeems to differ nothing from the *soul*; or ought at leaſt to be counted that ſubſtance, whoſe aſt the *soul* is. For ſuch is the *soul*, that it is not altogether a *body*, nor yet wholly without a *body*; it comes partly from without, and is partly born at home: in ſome ſort it is a *part* of the *body*, and in ſome the beginning and cauſe of *all things* which are contained in the *Animal body*; namely, *nutrition*, *ſenſe*, and *motion*; and ſo conſequently of *Life*, and *Death* alſo: for whatſoever is nourished; doth alſo *live*; and ſo on the contrary. Like- wiſe whatſoever is plentifully nourished, is alſo enlarged; but that which is too ſparingly nourish-
ed

ed, doth diminish: that also which is perfectly nourished, doth continue in health, but that which is not, doth incline to diseases. The blood therefore, as well as the *soul*, is to be reputed the cause and author, both of Youth, and Old Age, of Sleep and Waking, and of Breathing also: especially since in Natural productions the first Instrument doth contain in it self the internal moving cause. And therefore it comes all to the same reckoning, whether we say, that the *soul* and the blood, or the blood with the *soul*, or the *soul* with the blood, doth performe all the effects in an *Animal*.

We use, as persons that neglect the things themselves, to pay much reverence to the specious names. The blood which is still at hand, and daily in our view, makes no great noise in our ears; but at the magnificent name of *Spirits*, and of an *Innate Heat*, we are strangely amused. But when once the vizour is plucked from before them, as our errour, so our wonder ceaseth. That miraculous Stone, rendered so venerable to *Mizaldus* by the commendation of *Pipinus*, did not onely fill him with admiration, but *Thuanus* also: (who was an eminent *Historiographer* in his time) I shall here adjoin the Riddle it self. I saw, saith he, a Stone which was lately brought hither to our King out of the East Indies, which Stone did dart forth light, and brightness, after a wonderful manner, sparkling and shining with so much incredible lustre, as if it were all burning, and in a flame. This stone doth by his rayes scattered into every corner, illustrate the ambient aire with so clear a shine, that the firmest sight is scarce able to behold it. It is also most impatient of earth: for if you attempt to cover it, it doth of its own accord, with an impetuous violence fly upward.

All the Art of man cannot confine and shut it up into a narrow room, for it seemeth to be affected with free & open places onely. The infinite purity, and brightness thereof, is not tainted by the least spot, or blemish. It hath no certain shape or figure, but varieth, and is altered in an instant. And though it be most faire and beautiful to the Eye: yet will it not endure to be touched: and if you attempt too long to handle it, and continue too obstinate in your resolution, it will mischiefe you: as many in my presence have deerly found. And if any thing be by violence taken from it, it remaines for all that (which is very wonderful) nothing less then it was before. The stranger who brought it, addes farther to all this, that its virtue and power is exceeding useful to sundry employments, but will not discover them without a great reward.

This travailer also might have added to his description, that this Stone is neither soft nor hard; that it puts on several shapes and complexions, that it hath a continual trembling and palpitation, and doth like an *Animal* (though it be an *Inanimate* thing) daily devour great store of food, converting it to its own nutriment and augmentation: and that he hath been told by men of good credit, that this Stone did long ago fall down from heaven, and is to this day the cause of *Thunders* and *Lightnings*; being some times begotten by the refraction of the *Sun-beams* through the *Waters*.

Who can but admire so strange a Stone, and conceive less of it, then to be above the power of the *Elements*, and so to partake of another body, and of an ethereal spirit, especially when he finds that it is answerable in proportion to the *Element* or *substance* of the *sun* himself. And yet if *Ferne- De abd.*
lius may be the *Oedipus*, all this is but a Riddle of *rer. caus.*
the Flame. In l. 2. c. 17

In like manner, if I should describe the *Blood* under the veil and covering of a *Fable*, calling it the *Philosophers stone*, and displaying all its endowments, operations, and faculties, in an *enigmatical* manner; doubtless every body would set a greater price upon it, and believing it to act beyond the *Activity* of the *elements*, would ascribe another and more divine body unto it.

Of the Primigenial Moisture.

EXER: LXXII.

WE have now adorned the *Blood* with the Title of *Calidum Innatum*; and do likewise conceive it proper, to dignifie the *Colliquamentum Crystallinum*, as we call it (out of which the *fetus*, and its first parts do immediately arise) by the name of *Humidum radicale & Primigenium*, the *Radical* and *Primigenial* moisture. For we meet with nothing in the *Generation* of *Animals*, to which this title doth upon better right belong.

We have stiled it the *Radical moisture*, because out of it the first particle of the *fetus*, namely the *Blood*, and all the *post-genit* parts do arise, as out of their *Root*; and do owne the same, as the matter out of which they are procreated, fed, increased and conserved.

We likewise call it *Primigenial*, because it is first generated in the constitution of every *Animal*, and is as it were the foundation of all the other parts: as is evident in an *Egge*, in which after a short time of *Incubation*, it doth approve it self to be

be the first production of the implanted fructifying, and generative faculty.

It is likewise the most simple, pure, and sincere body imaginable: wherein all the parts of the *Chicken* do abide in *potentia*, but none, *actu*: nature seeming to have afforded to it the same privilege which men commonly ascribe to the *materia prima*, or first Matter, for which all things spring; namely, to be capable of all formes, potentially, but to possess none, actually. So the *Crystalline humour* of the Eye, to the intent that it may be susceptible of all Colours, is it self void of all: and in like manner the *Mediums*, or organs of each particular sense, are quite destitute of the qualities of sensible things, or objects: namely the Organs of Hearing and Smelling, and the *Aire* which is subservient unto them, are without all Sound or Odour: so likewise, the moisture of the tongue and mouth, is of it self inspid. And upon this Argument chiefly doe they rely, who constitute *Intellectum possibilem incorporeum*, a Potential Understanding which is incorporeal, namely, because it is susceptible of all formes without matter; and as the *Hand* is called *Organum Organorum*, the instrument of instruments, so they affirm that to be *formam formarum*, the Form of forms, having no matter at all, but being altogether *Incorporeal*, and therefore they assert it to be *Possibilis*, Potential, but not *Passibilis*, passible. And this moisture also doth seem, if not the same, yet proportionable to the last Aliment, whereof *Aristotle* doth teach that the *Animal Geniture* or Seed is made. I say the last Aliment, which the *Arabians* call *Ros*, the Dew, wherewith all the parts of the Body are moistned and bedewed. For as that dew doth by farther condensation and adhesion pass into the alible gluten

ten, or glewey substance, and *Cambium*, which is that substance which doth constitute the parts of the body: so on the contrary, in the first generation and nutrition, out of the glutinous substance dissolved and rarefied, is made a Dew: namely, out of the White of an Egge is the *Colliquamentum* framed; which is the radical moisture, and *Ros primigenius*, the primigenial Dew. Nay if there be any faith due to our observations, the matter is the selfe same in both; and that is a truth which all *Philosophers* consent in, and *Physitians* do not dissent, namely, that an *Animal* is nourished by the same thing whereof it is made; and augmented by that out of which it is generated. So that *Ros nutritius*, the nutritive Dew, doth differ from the *Colliquamentum*, or primigenial moisture, onely under the severall respect of that which is first, and that which is after: in that this is concocted and made by the *Parents*, and that by the *Fætus* it selfe: and both the juices are the next and immediate aliment of the *Animal*: yet not the first aliment; according to that saying, *Contraria ex contrariis augeri necesse est*, Contraries are necessarily encreased out of contraries; but the last (as I have said, and as *Aristotle* also doth denote) according to that other saying, *Similia ex similibus*, Like are fed by like. And both these humours doe stand in that *proximâ potentiâ*, that next or most immediate capacity or potentiality, by which (all impediments being removed) they are ready of their own accord, or by the law of nature, to pass or be transformed into all the parts of the Body.

Which things being so, all the controversies which doe arise concerning the matter, and aliment of *Animals*, seeme to be easily reconciled.

For

Ex. LXXII. Of the Primigemial moisture. 465

For whereas some were of opinion, that the seed, or matter ejected in coition was deduced from all the parts of the body, and that therefore the child had the resemblance of the Parents imprinted in it, Aristotle saith thus : *We must be of a different judgement from the Ancients : for whereas they doe own that to be the seed which is discharged from the whole body ; we conclude that to be the seed, which of its own inclination doth conduce to the constitution of the whole body : and whereas they call it a Colliquamentum, or melted substance, we rather stile it excrementum, an excrement ; (but he had a little before said, I call an excrement the reliques of the aliment, and a Colliquamentum, that which is separated from the excrement by a praternatural resolution :) for that which commeth last to the parts, and is the excrement of that last aliment, is in probability a like substance. As Painters have commonly some remnant of those colours, which they have spent upon their Pictures : but now that which doth melt away and dissolve, doth corrupt and degenerate. One Argument to prove that the excrement is rather the seed, then any colliquated matter, is this ; namely, that those Animals which are of great growth, are less fruitfull, but little Animals are most of all fertile. For there must of necessity be more dissolved matter in great Animals, but less excrement : for the stock of aliment is wasted in the support of a large bulk ; and thereupon there is little excrement. Moreover, there is no place designed by nature for the reception of that substance or matter which doth melt off from the body : but there is a place assigned to all the natural excrements : as for example, the Guts are intended for the excrements of the dry aliment ; the bladder of urine for the moist ; the stomach for the profitable or usefull excrements ; and the Womb, the Genital parts,*

De gen. an.
l. 1. c. 18.

and the Breasts, for the Seminal: for unto those places they resort, and assemble themselves. Likewise by several other arguments he proceedeth to maintain, that the seminal substance, out of which the *Fetus* is framed, is the same with that which is provided for the nourishment of the parts. As if a man should desire a little colouring from a Painter; surely the Painter would not scrape off that colouring which he hath already laid upon his Picture, but afford him some of that which remains, and this supernumerary staffe is of the same nature with that which he hath expended upon his Picture. So likewise the Excrement of the last Aliment, or the Reliques of that nutritious substance which is called *Ros*, and *Gluten*, is deposited in the Genetal parts: and this opinion is most agreeable to the Generation of the Egges in the Hen.

Physicians also (who conclude that all the parts at the beginning are made out of seed, or sperme, (and upon that ground call them spermatical parts) do affirm that the seed is by the power of the Genital parts made out of the last aliment (which they with Aristotle conceive to be blood) and so doth constitute the matter of the *Fetus*. It is indeed a plain case, that the egge is produced by the Hen, and from her last aliment (namely, her *Ros nutritius*, her nutritive juice.) The White therefore of an Egge, or that primogenit, or rather antegenit colliquamentum, or melted substance, is to be reputed the truer seed of the Hen (though it be not ejected in coition, but provided ready before coition, or else collected after it; (as shall be perhaps more largely declared, to be incident to several Animals) which the geniture of the Male doth according to Aristotle, coagulate.

Since

Since therefore I plainly see, that all the parts are fashioned and fed by this one *moisture* onely, (as the *matter* and first root of all) and since the fore-cited argument doth necessarily conclude as much; I can scarce refrain my pen from rebuking those that follow *Empedocles* and *Hippocrates* also: (who will needs have all similar bodies to be generated by the congregation of the four contrary *Elements*: (as being mixt bodies) and dissolved or corrupted by their *segregation*) nor is *Democritus* and the *Epicureans*, who follow him, less blameable, who constitute all things out of the confluence of *Atomes* of different *Figures*. For it was their errour of old, and is a popular errour at this day, that all *similar bodies* are framed out of *heterogeneous* or different bodies. For according to this opinion, had a man *Lincolus* his eyes he could not discern any thing that were *similar*, one in number, identity, and continuity: but there were nothing but an appearing union, and an assembly or heap made up of a congregation and certaine colligation of indivisible bodies; so that *generation* were nothing else but an *aggregation*, and convenient posture of several parts.

But for my part, neither in the production of *Animals*, nor in the *generation* of any *similar body* whatsoever, (whether it were of the parts of *Animals*, *Plants*, *Stones*, or *Minerals*, &c.) I could never discover any such *congregation*, or any several *præexistent* miscible bodies, which were to be united afterwards in the work of *Generation*. Nor (so far as I could ever yet perceive, or by any meanes observe) are there any *similar parts* which are first constituted in their several order, or existence at the same time together (as mem-

branes, flesh, fibres, gristles, bones, &c.) that so from them conioined together (as out of the *Elements* or first rudiments of *Animals*) the organs or parts, and the whole entire animal should at last be framed; but as we said before, the first rudiment of the body is onely a similar soft gluten, or stiff substance, not unlike a spermatical concernment, or coagulated seed: out of which (the decree of *Generation* going on) being changed, cut in sunder, or distributed into several parcels, as by the divine Mandat as we have said, (let here be a *Bone*, there a *Nerve*, or a *Muscle*, here the *Bowels*, the receptacles of the *Excrements*, &c.) out of an inorganical substance, was made an organical: out of one, and that one being of the same nature, were many things made, and those also diverse, and contrary: not by a kind of transposition, or local motion (as if by the virtue of the heat, there did arise a congregation of homogeneous, and a disgregation of heterogeneous bodies) but rather by a disgregation of homogeneous parts, or bodies, then any composition of heterogeneous.

And this do I believe to be observed in every *Generation*; so that the Similary mixt bodies have not their *Elements* existent in time before them, but are rather themselves in being before their *Elements*, (whether you understand by *Elements* the *Fire*, the *Aire*, the *Earth*, and the *Water*, with *Empedocles*, and *Aristotle*; or the *Salt*, the *Sulphur*, and the *Mercury*, with the *Chymists*; or the *Atomes* with *Democritus*) as being in *Nature* more perfect then they. There are I say mixt and compounded bodies, even in respect of time before any *Elements*, as they call them, into which they are corrupted and determine; for they are dissolved into those elements rather in order to our apprehension,

hension, then really and actually. And therefore those bodies called *Elements*, are not before those things which are made and generated; but rather after them, and their Reliques rather than their Principles. Nor doth *Aristotle* himself, nor any other *Philosopher*, demonstrate that the *elements* do subsist apart, or are the Principles of similar bodies.

Indeed *Aristotle*, where he goes about to prove, ^{L. 3. de celo. c. 31.} that there are such things as *Elements*, seems to waver in his judgement, whether he should resolve that they were *actually* in being, or onely *in potentiâ*: and doth conceive that in natural things they are *in potentiâ* rather than *actû*: and therefore he affirms that there are such things as *Elements*, out of the *division, segregation, and solution* of things. And yet that is but an infirme argument, namely, that natural bodies are generated or compounded first out of those things, into which they are at last dissolved and corrupted: for by that argument, somethings should be compounded of Glasse, of Astres, and of Smoak; (because we see them reduced at last into such bodies) and since *Artificial Distillation* doth clearly demonstrate, that so many several Vapours or Waters, and those all of them of different Species, are extracted out of so many several bodies; the number of the elements ought to multiply *in infinitum*. Nor doth any *Philosopher* say, that the Bodies which are dissolved by *Art*, and are called *Sincere Bodies*, and *indivisible in species*, are more *single elements*, then the *Aire, Water, and Earth*, which we perceive by *Sense*, and are obvious to our eyes.

And lastly, we do not see that any thing is naturally produced out of *fire*, as a *miscible substance*;

De gen. &
corr. l. 2.
c. 50.

and perhaps it is altogether impossible there should; since *fire* (like a kind of living body) is in continual flux, and seeketh sustenance whereby it may be nourished, and conserved: according to that of *Aristotle*, that *fire* onely is nourished, and that chiefly because of its form. But whatsoever is nourished, cannot possibly be it self mixed with its nutriment. Whereupon it followeth, that it is impossible for *Fire* to be miscible. For *Mistion*, according to *Aristotle*, is *miscibilium alteratorum unio*, the union of miscible things altered; where one miscible thing is not transformed into another, but both of them being both *active* and *passive* in regard of themselves, do constitute a third thing: but generation (especially that which is by a *Metamorphosis*) is the distribution of one similar thing which is to be altered into diverse more. Nor are mixt similar bodies said to be generated out of the *Elements*, but in some sort to be constituted out of them: into which also they are capable to be dissolved.

But these matters do properly relate to that part of *Physiology*, which treateth of the *Elements*, and the *Temperaments*: where also we shall discourse more copiously of them.

Of the Birth.

After the Generation, the Birth succeedeth, by which the *Fetus* comming into the world, doth enjoy the outward *Aire*. Whereupon we conceive it convenient to speak something concerning it. And therefore (with *Fabricius*) we shall consider the *Causes, Manner, and Times of Birth*; as also those things which are precedent and subsequent thereunto.

Those things which are incident a litle before the *Birth*, and especially to *Women*, presaging the approaching delivery, are in part the preparation and disposition of the *Childing Woman*, whereby she may bring forth: and in part the scite, or proper position of the *Infant* in order to the *Birth*.

As concerning the *Position*, *Fabricius* saith, that it is of a conglobated and inflex figure, left the *Fœtus* by his extream and eminent parts, might injure the *Womb*, or the containing membranes: and likewise that so he may be comprehended in the lesser roome. But I am not of opinion that the *fetus* doth still observe the same scite or posture of his members in the *Womb*, (for the fore-scited causes.) For he swimmeth in a water, and moveth himself to and fro, he stretcheth himself, now this way, and anon that, and so is variously inflected, and tumbled up and down; in so much that sometimes being entangled in his own *Navel-string*, he is strangely insnared. True it is that all *Animals*, while they lye still and sleep, do for the most part draw in, and contract themselves, and direct themselves toward an *Oval* or *Conglobated* figure. So likewise *Embryo's*, which pass their time

De form.
Fœtus c. 9.
pag. 140.
The Position of the *Fœtus* in the *Womb*.

most in slumbers, do compose their bodies in that posture wherein they are formed : (as being the most natural, most easie, and most advantageous for their sleep.) And therefore the Infant in the Womb is commonly found, with his Knees drawn up to his Belly, his Thighs bent backwards, his Feet hanging down, and his Hands elevated to his Head, whereof the one is placed about his Temples or Ears, and the other at his Cheek ; in which parts there are white spots discovered in the skin, as being the signes of his consfrication : His Spine is bent round, and his Neck being inflected, his Head hangs neer his Knees. The Embryo is scituated with that position of parts, wherewith we commonly apply our selves to rest, with his Head uppermost, and his Face directed towards his mothers Spine. But a litle before his Birth, his head being bent downwards, he dives towards the bottom, and the Orifice of the Matrix, (as if he were seeking his way out.) So Aristotle : *All Animals do naturally come into the world with their head foremost ; but those that lye cross, or come with their heels foremost, are unnatural births.* But yet this is not constant in all Animals, but according to their several site or position in the Womb, so is their Birth various ; as in Bitches, Sows, and other Multiparous Animals. And the Great-bellied Women know full well, that even the humane Embryo doth sometimes acquire a different scituation ; when they find the Child kick sometimes above, sometimes below, and now on this side, and at other times on that.

Hist. an.
2. c. 8.

The Ma-
trix.

So also the Matrix being neer delivery, doth bear down, groweth soft, and openeth its Orifice. The Waters also as they commonly call them, are Gathered, that is, a certain part of the Chorion, in which

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which the fore-said *humour* is contained, doth usher in the *Fetus*, and slide down from the *Matrix* into the *Vagina*, or Sheath of the Womb: and the neighbouring parts also are loosened, and ready to distend: also the *Articubation* of the *Holy bone*, and the *Share-bone* to the *Hanch-bone* (which Copulation, or Articulation is by *Synchondrosis*, or a *gristly ligament*) is so softened and loosened, that the fore-said *bones* do easily give way to the parting *Infant*; and by gaping open, do amplify the whole *region* of the *Hypogastrium*, or *Lower belly*. And when these things are in this condition, it is certain that the *Birth* is at hand. And that so the *Fetus* (like a ripe fruit) may come forth into the World, Nature makes this provision of dilating the parts: as she likewise concocteth the *Milk* which is sent before into the *Breasts*, that the *Infant* now ready to be born, may have his entertainment ready to wellcome him, being now to be sustained from without. And these are the fore-runners of the *Birth*. Wherefore the *Milk* is counted amongst the chiefest signes of an *imminent birth*: I mean such *Milk*, which both for store, plenty, and consistence, is convenient to feed the *Child*: which (according to *Aristotle*) is never so qualified but neer the time of the *Birth*, and therefore is never found before the seventh moneth.

Fabricius concludeth upon two queries, chiefly *Gen. an. l. in order to the Fetus: namely, how the birth is, 4.c. 8. & and when? the last whereof relates to the time of l. 7. c. 5. Bearing, the first to the manner of the Birth it self. pag. 141.*

The times of bearing, are by *Aristotle* conceived *De gen. an. to be various. There are, saith he, peculiar times^{l. 4. c. 4.} of bearing to all kind of Animals, for the greatest part & ult. as long as they live: for the race of Animals which is longer*

longer liv'd then others, must of necessity be more durable. But the magnitude of the *Animals* is by him assigned as the chiefest cause of the variety of the times of bearing. For, saith he, the great fabric, either of *Animals*, or any thing else, cannot be easily absolvd in a short space: Wherefore *Mares*, and those *Animals* that are of kin to them, though they live but a shorter time, yet they are longer in bringing forth: And therefore the *Elephant* (as they say) is two years in her production, because of its excessive magnitude. But every *Animal* hath certain bounds of magnitude, which it cannot exceed: and therefore they have a definit matter, out of which they are made: he addeth moreover: But there is exceeding good reason, why *Animals* do receive the dimension or measure of their times of ingravidation, generation, and their lives also by certain *Circulations*. Now I call a *Circulation*, a day, a night, a moneth, a year, and all those times which are described by them, as also the motions of the *Moon*: for these are the common beginnings of *Generation* to all *Animals*: For it stands to good reason that the *Circulations* of less principal things should follow the *Circulations* of more principal. And therefore *Nature* hath defined or limited the generation and decease of *Animals*, by their motions.

And as the Births of *Animals* do depend upon the *Revolutions* or *Circuits* of the *Sun* and *Moon*, so do their times of Coition, and bearing their young vary, and are either more prolix, or breifer.

The time of going with young (saith *Aristotle* in the same place) is enormous onely in *Women*. For all other creatures have some one time, but a *Woman* hath several, for a *Child* may be borne either the *Seventh*, or the *Tenth* moneth, and likewise in the moneths intervening

intervening between the Seventh and the Tenth : For they that are borne in the Eighth month, though they seldom live, yet they may live. Diverse Animals have indeed a set time of bringing forth, and specially in the Spring, when the Sun returns ; diverse in the Summer, and some in the Autumne, as the Gristley Fishes. And hence it happens, that when the time of bringing forth approacheth, they direct themselves to their wonted places, where they may safely build their Stalls, or Nests, where they may bring forth, cherish, and sustaine their young.

Hence it is that those Winds which blow about the beginning of the spring, are called, *Ornithie*, namely from the coming or flocking in of the Birds, which about that time, do by the help of those Winds arrive at certain usual places. And Fishes also which swim in Shoals many hundred thousands together, do conspire to meet in such particular parts, and at such set times, to spawn and cherish their fry.

And likewise in the Spring, so soon as ever the Cankerwormes do appear, (whose seeds are for the most part carried about by the Winds like invisible Atomes ; and are not begotten as people commonly believe, either of their own accord, or out of putrefaction) the trees do presently shoot forth their buds, which are to become the sustenance of those creatures: and they themselves also are pursued by small Birds, and conducted into their Nests to be devoured by their young.

So that whensoever we see unusual kinds of these Canker-wormes, we do likewise meet with several sorts of forraign litle birds, which are seldom seen at other times, (as if these Birds did pur-

perſue them from remoter nations) and they both lay about the ſame time. Phyſicians, upon ſight thereof do preſently prognofſticate now diſeaſes to enſue. The *Bees* do ſwarm in *May*, when there is plenty of mellifluous *Dew*: the *Waſpes* in *Summer*, when the *Fruits* grow ripe: as the *Viviparous* productions fall out, when they have convenient *Milk* in their *Dugges*, or *Udders*. But other *Animals*, which inhabit the ſame Country ſtill, and do not ſhift their region, have their cuſtomary times of bringing forth, and the ſupply of their food ready for them at ſet and appointed ſeaſons. By which means it comes to paſs, that the *Huſbandmen* do calculate the ſeaſons for tilling the ground, ſowing, and harveſt, by the approach of certain *Birds*, and chiefly from the conflux of, and number of *Rooks*. And yet there are ſome *Animals*, whoſe times of bringing forth are various and uncertain, as it is uſual with the greater part of domeſtick *Animals*: For they do celebrate their Coitions at ſeveral times, and alſo bring forth young ſo too: by reaſon of the plenty they live in, and diſorderly laſciviuſneſs, which is beſides the courſe of *Nature*. But yet ſuch *Animals* (as *Women* alſo) have more difficult, and more dangerous teemings.

Sympos. l.
3. qu. 10.

Some kind of creatures, which do more obſerve the revolutions of the *Moon*, do celebrate both their Coitions, and productions, at any time of the year whatſoever: as *Conies*, *Mice*, and *Women*. For the *Moon* is ſaid (according to *Plutarch*) to conduce much to the expedition of the delivery, when ſhe is in the *Encreaſe*: becauſe ſhe then by ſuppling the humours, doth mitigate the paines. Hence I conceive the names of *Locheia*, which ſignifieth the Preſident of the Birth, as likewiſe of *Eilytheia* or *Lucina*,

were

were bestowed upon Diana ; for Diana is the same with the Moon.

Other Animals, (saith Pliny) have a set time of Bearing, and of Production : but men are begotten at no certainty, all the year long. For though there be a set time designed us by Nature, yet there doth sometimes arise a vast difference ; so that some have been reported to bring forth at the seventh moneth, and others at the fourteenth. And though Aristotle writes that those which were borne in Greece the eighth moneth did generally die : yet he confesseth that in Egypt, and some other Countries (where the Women bear very well) they did survive. And though he saith, that none can possibly live, who are born before the seventh moneth, (but the seventh month is the beginning of a ripe and mature Birth :) yet most who are then born are infirm and weak, and therefore the people wrap them up in Wool: He nevertheless doth acknowledge, that such may live.

Franciscus Valesius relates that in his time, a Girl which was borne the Fifth moneth, did live to enter into the twelfth year of her Age. Adrianus Spigelius recordeth the story of a certain Carrier, who did shew it under the publick Notaries hand of the Town of Middle-Burgh, that he was borne in the beginning of the sixth moneth, but so little and weak in his body, that his Mother was forced to route him up in Cotton, untill he had gained strength, whereby he was enabled to endure the Swath. And Avicen also reports of One who was borne the sixth moneth, that lived healthy. So also that some who were borne after the eleventh moneth have lived, is approved by the testimonies both of the Ancient and Modern writers. Massurius (saith Pliny) writes, that L. Papirius the Pretor, when the second

Hist. an. l.

7. c. 4

Ibid.

In his Epistle de Incerto tempore partus.

L. 9. de nat. an. cap. ult.

In the fore-cited place.
Son

Son sued for the Inheritance, did cast him in Law though his Mother did affirm that the eldest Son was born in the thirteenth moneth: because there seemed to be no certain time allotted for bringing forth. There was a Woman not long since amongst us, which kept a Child within her above sixteen moneths, and perceived him to bestir himself in her Womb above ten moneths (as many did evidence) and yet at last she brought him forth alive. But, I confess those are rare accidents. And therefore Spigelinus doth reprehend Ulpian the Lawyer without cause in that he admits none to be legitimate Heires that are borne after the tenth moneth. For Lawes and rules of Art, are for the most proportioned or fitted to the actions of life, which are rightly ordered.

Hist. an. l.
7. c. 4.

Besides, it must not be denied, that there are many crafty, fraudulent Women, which for lucre sake, or for fear of punishment or infamy, will feign and swear that they are with Child. And likewise it is well known, that others are easily deceived, and being inexperienced in the matter do conceive themselves to be with Child, when it is no such thing. And to this purpose are those words of Aristotle. The conception of those Infants which are borne after the eleventh moneth seemeth to have not been exactly known to the Women who are with Child, for the women do not know when they first conceived. For their Wombs being possessed with flatulencies, and they afterwards conceiving a Child upon Coition, conceive that flatulency to have been the first beginning of their conception, because they then had some usual indications, as do accompany such as do really conceive. And we have also at other times known, that after three, or four moneths space, the former conception dying in the

the Womb, and putrifying, and the corrupt matter (like to putrid after-purgings) flowing forth, a *Superfatation* hath happened: and yet the same Women have constantly affirmed that they have been delivered of a Child after the *fourteenth moneth*. It falleth out some times, saith Aristotle, *Ibid.* that after one *Abortment*, teene or twelve succeeding Infants which have been conceived by a *superfatation*, have fallen from the Mother. But if the Mothers have been delivered in some short time after, they have brought forth that Child which was begotten by a *superfatation*: and so they bring them forth, like those children which are born *Twinnes*: As the Fable runs of *Iphicles* and *Hercules*. And this hath been already found to be so. For a certain *Adultress* brought forth two Children, one like her own Husband, and the other like the *Adulterer*. And likewise a certain Woman a long while since, having *Twinnes* within her, did conceive a third Child also, so that when the time of her delivery was fully come, she brought forth the *Twinnes* in their just time, and they were perfect: but the third was but of five moneths time, and so he died instantly.

A certain *Servant-Maid* being gotten with Child by her Master, to hide her knavery came to London in September, where she Lay in by stealth: and being recovered again, returned home: but in December following, a new birth (for she had a *Superfatation*) did proclaime the crime which she had cunningly concealed before.

It happened to another Woman (as Aristotle proceedeth) that when she had brought forth one Child in the seventh moneth, she was after two moneths end, delivered of two more, whereof the first Child died, but the *Twins* survived. Likewise some Women that have suffered *abortment*, have conceived two Children at the

the same time, whereof the one hath been aborted before the time, and the other hath continued the full time, and been brought forth perfect.

For it is an easie matter, that the first, or last Conception which is conceived by a *Superfatation*; being ejected after the third or fourth month, the following moneths may be reckoned more or less then they ought to be, especially by credulous or unskilful Women.

I have sometimes known the Conception to perish in the Womb, and being turned into Putrid Matter, to have glided and issued forth: (like the *flores albi*) and this both in Women and other Animals. There was not long since a Woman in *London*, which after such a kinde of Abortion, did conceive again; and was delivered at the just time. But a litle after, as she went about her worke, being not in any great paine, or distemper, she did eject by peices the black little Bones, which related to her former Abortion. Some of these Bones were brought to me, which I could discover to be the fragments of the Spine, the Bone of the Thigh, and of other Bones.

I know a young Woman, who was the Daughter of a Physitian, who was of my neer acquaintance, which being Big, felt all the Symptomes incident to Women in that condition; and continuing healthy and sprightly, after the fourteenth week she perceived the motions of a *Fetus* in her Womb; and having finished her time for going with Child, conceiving the hour of her delivery to be nigh at hand, she had her Bed furnished, her Cradle ready, and all the implements appertaining to the purpose laid out for use. But all these preparations came to nothing, and *Luci-*

na was cross to her wishes; for her customary paines quite left her, and her Belly as it rose by degrees, so it sunk againe, and shee never sicko for the matter, but she remained barren ever after.

I also knew a noble Matron, who had borne above ten Children, and whose *Courses* were never suppressed unless she were with Child. But being afterwards married to another Husband, besides other usual signes, she apprehended her self to be with Child, by the stirring of it (which both she her self, and her Sister also, who then lay with her in bed, did many times in the night perceive) and all the Arguments I could suggest, could not remove that perswasion from her: till at the last, all her hopes vanished into flatulency and *fatnüss*.

So that sometimes, the most approved signes of *Ingravidation*, have not onely deluded the silly Women, but the experienced *Midwives*, and the skilful Physicians themselves. Wherefore, since besides the deceits of Women themselves, there are several false Indications of Gravitation, we must not rashly determine of the Inordinate Birth, before the Seventh Moneth, or after the Eleventh.

The ordinary Computation of *going with Child*, observeth that time which our blessed Saviour, the perfectest of all men, did fulfil in the *Virgins Wombe*: namely, from the day of the *Annunciation*, which is in *March*, to that blessed day of the *Nativity*, which we celebrate in *December*. And according to this *Rule*, the Sager *Matrons* keeping their account (while they cast in the wonted day in every moneth, whereon they were accustomed to have their *purgations*) they

are seldom out of their *Reckoning*; but, ten *Revolutions* of the *Moone* beeing expired, they are delivered, and reap the fruit of their *Wombe*, upon that very day whereon (were it not for their *Pregnation*) their *Purgations* would ensue.

De usu
part. l. 15.
c. 7.

As concerning the causes of the exclusion or delivery of the *Fetus*, *Fabricius*, besides that given by *Galen* (wherein he delivers, That the *Fetus* is so long continued in the *Wombe*, till being now enlarged and made perfect, he is capable of being sustained at the mouth: by which argument, the weaker sorts of *Fetus* ought to protract their continuance in the *Wombe*, which yet is no such matter:) conceives the other reason, and that the more rational one too, to be the necessity that the *Fetus* standeth in of more large refrigeration procured by respiration: because the *Fetus*, so soon as it is borne, doth presently respire, but doth not so soon feed. And this (he affirmeth) is not onely observable in Men and Beasts, but chiefly in Birds: which though they be small, and have yet but a tender bill, yet will the *Chickens* peck that part of the shell, where they stand in most need of respiration: which thing they doe, being more streightned for Breath, then *Aliment*: Seeing that immediately as soon they are escaped out of the shell they doe respire, but abstaine from meat two or three dayes together.

But whether *Respiration* be instituted for *Refrigeration*, or for any other use: we shall more largely debate elsewhere, out of our *Observations*.

In the mean time I shall propose this *Probleme* to the Learned; namely, How the *Embryo* doth subsist after the seventh moneth in his *Mothers womb*? when yet in case he were borne, he would instantly breath: nay he could not continue one small hour

hour without it? and yet remaining in the *womb*, though he pass the *ninth moneth*, he lives, and is safe without the help of *Respiration*. I shall deliver it yet more plainly. How cometh it to pass, that the *Fetus* being now borne, and continuing yet covered over with his entire *membranes*, and abiding still in his *water*, can subsist for some hours space, without any danger of *suffocation*: and yet being shifted out of those *membranes*, if he have but once attracted the *Aire* into his *Lungs*, he cannot afterwards live a minute without it, but dyeth instantly? doubtless this is not for want of *Refrigeration*: for in a difficult Delivery, he sticketh fast in the streights without any *Respiration*, sometimes for some houres together; and yet we find him alive: but yet so soon as he hath escaped, and tasted the *vital air*, if you deprive him of it, you destroy him in a moment. So likewise in the *Cesarean Section* the Infant is taken out of his *Mother's wombe*, many houres after his *Mother's* decease, and yet he is found alive, and continueth safe, without the use of *Aire*, though he lye intombed in the *Secundines*: but having once attracted the *Aire*, (though you instantly restore him to the *Secundines* againe) he will expire for want of *breath*. Whosoever doth carefully consider these things, and look narrowly into the nature of *Aire*, will (I suppose) easily grant, that the *Air* is allowed to *Animals*, neither for refrigeration, nor nutrition sake. For it is a tryed thing, that the *Fetus* is sooner suffocated after he hath enjoyed the *Aire*, then when he was quite excluded from it: as if the *Heat* within him, were rather inflamed, then quenched by the *Aire*.

But thus much we have discovered by the way

concerning *Respiration*; being perhaps resolved to discuss the debate more fully in its proper place: then which disquisition you shall hardly meet with a more nice; for it is debated with *Arguments* of almost equall weight on both sides.

I return to the Birth, which *Fabricius* conceiveth to come to pass (besides the fore-mentioned necessity of *Respiration*, and want of *Sustenance*) because the *Fetus* being grown bigger, doth press out by his weight; and also can be no longer contained within, by reason of his large bulk; and likewise, saith he, the *Excrements* are so multiplied, that there is no longer place for them in the membranes. But we have already proved, that the humours in the Wombe are not *Excrementitious*. Nor is the reason deduced from the Weight and Magnitude of the *Fetus* more available then the former: for the *Fetus* swimming aloof in the humours, is scarce any burden at all to the *After-birth* or *Womb*; for some *Infants* of nine moneths are very litle, and less then some others of eight moneths onely, yet can they no longer subsist in the Womb. And as to the Weight, *Twins* of eight moneths do preponderate any one single *Fetus* whatsoever, though of nine moneths abode in the Womb, yet are they not born till the ninth moneth. Nor can we quarrel at the scarcity of Aliment: since at that time there is entertainment enough even for *Twins*, and sometimes for more *Infants*: and also the milk which is conducted to the Breasts of Women in *Child-bed*, being recalled to the *Uterus*, would as conveniently supply the *fetus* in the Womb, as out of it.

I shall rather inpute the cause of being born, to the juice contained in the *Amnion*, which being
most

most proportionate to the nourishing of the *Fetus*, doth either much faile, or else is depraved by the admixture of the superfluities. As I have also hinted before.

But as for the diversity of *going with Child*, which is contrary to the time allotted by Nature (which diversity doth chiefly respect Women) I do ascribe it to the custome of living, the infirmity of the constitution, and the several passions incident to Women. And therefore those tame Animals, which live amongst us, by reason of their lazy lives, and plenty of food, are of more incertainty in their times of Coition, and production, then wild Beasts, which live according to Natures intent. Likewise sickly Women have easier and greater dispatch in their *Travaile*, then others: but it falls out clean contrary to such Women, whose strength is very much consumed. For the same thing befalls them, as happeneth to *Plants*, whose fruits and seeds, do more slowly and seldom arrive to maturity in cold Countries, then to other *Plants* of the same kind which are in a fat and warm soile.

So *Orenges* in *England* adhere to the trees almost two whole years together, before they come to maturity: and *Figgs* also scarce ever arrive at any perfection here, which are ripe in *Italy* twice or thrice a year. And the like befalleth the fruits of the *Womb*; namely, the *Fetus* is brought to maturity sooner or later, by reason of the scarcity or plenty of Aliment, the imbecillity, or strength of the body, and the orderly or inordinate regimen of life (according to the six non-naturall things recited by Physicians.)

Fabricius hath described the Manner of the Birth, thus: *The Womb being dilated by the weight*

The man-
ner of the
Birth.

of the Fœtus; inſo much that it can now be no farther diſtended, and thereupon being excited to diſburden it ſelf, is by the motion of the tranſverſe fibres gathered up into it ſelf, and ſo contracted into a narrower compaſſ. And therefore, whereas before, neither the Excrements, by means of their abundance, nor the Fœtus by reaſon of his weight could be conſeined any longer, the Uterus being more ſtreightned and drawn together then it was, can be much leſſ able to contain them, and therefore firſt the membranes as being the weaker parts, and more diſtended, do break, and the humour which is moſt fluxile, doth firſt paſs out to make the parts glibbe. And hereupon the Fœtus followeth, as being not onely increaſed in his weight (by reaſon that he now no longer ſwimmeth in the humour) and ſo deſcendeth downwards, forcing the Oriſice of the Womb, but as being alſo compreſſed, driven forward, and ſhut out by the action of the Womb it ſelf: in which action, the muſcles of the Abdomen, together with the Midriffe, are wonderfully aſſiſtant.

By which words he deſcribes the ejection of the Excrements of the Guts, and an Abortion rather, then a Natural Birth: for though the membranes in Women do for the moſt part break, and ſo diſload the Water before the Birth; yet that is not always ſo: for other Animals do not bring forth as they do, but produce the Entire Conception together, (namely the *fœtus* together with the *Secundines*) as we may obſerve in *Ewes*, *Mares*, *Ditches*, and other Animals: and eſpecially in the *Viper*, which doth conceive within an Egge which is of one onely colour, having a ſoft ſhell (ſuch as the humane conception is) and continueth that Conception ſo long within her, until a *fœtus* be formed thereout, which ſhe doth produce wrapped

ped up in a membrane, which membrane (according to *Aristotle*) is broken up the third day. And yet it so happeneth, sometimes, that the young ones are produced, having eaten through the membranes, (while they are yet in the *Uterus*.)

Hist. an. l.
5. c. 34.

And so also it is no novelty to experienced Midwives, that their Women do sometimes bring forth their Conceptions whole, and entire, without any breach in the Membranes at all. And this kind of birth seemeth to me the most *Natural*; wherein the *fetus* (like a *mellow fruit* which drop-peth from the *tree*, without shaking out its seed before the time assigned by *nature*) is born with the *Secundines* embracing it. But, where it cometh otherwise to pass, and the After-burden doth adhere to the *Uterus* after the Child is borne: it is oftentimes hardly divided from it, and doth induce evil *Symptomes*, which are accompanied with noisome smells, and sometimes with a *Gangreen*, whereby the Mother is brought into imminent danger.

Because therefore the *Birth* described by *Fabricius*, is not agreeable to all kinds of *Births*, but onely to Women, and not to all their Births neither, but to such onely whose Births are premature, and as it were forced: it is to be ranked rather amongst *preternatural*, *precipitate*, and in some sort abortive productions.

In a *Natural* and *Genuine Birth*, therefore, two things are required, which are assistant the one to the other, that is to say, the Woman in travaile, and the *Fetus* which is to be produced. Both which, except they be ripe for the business, the Birth is hardly successful. For if the *Fetus* being disquiet, and coveting to be enlarged, doe prevent his parent by exciting her, and offering

Two things required in a Natural Birth.

violence to her womb : or if the Mother, by reason of the infirmity of her retention, (as if her womb were disturbed with a kind of nauseousness) or by some necessity of expulsion, be before hand with the Infant, the Birth is to be reputed a Disease or Symptome, rather then a Natural and critical Production. As also when some parts of the conception escape out, and others are stil retaind within: namely, if the *Fetus* attempt a departure ere the After-burden be dismissed from the sides of the Womb ; or else the After-burden, on the contrary, be loose from the *Uterus*, the *fetus* being not rightly composed, nor the *Uterus* relaxed for the accommodation of the work. And therefore the younger, more giddy, and officious Midwives are to be rebuked ; which, when they hear the woman in travaile, cry out for paine, and call for help ; lest they should seem unskilful at their trade, and less busie then comes to their share, by daubing over their hands with oyles, and distending the parts of the *Uterus*, do mightily bestirre themselves, and provoke the expulsive faculty by medicinal potions : so that being impatient of a competent expectation, by their desire to hasten and promote the Birth, they do rather retard and pervert it, and make it an unnatural and difficult delivery ; and leaving the Membranes, or some part of the *After-burden* still adhering to the Womb, they do both expose the poor women to the injuries of the Aire ; and vainly perswading them to their three-legged stoole, weary them out, and bring them in danger of their lives. It is much happier with poor women, and those that dare not own their great bellies, where the Midwives help is never required ; for the longer they retain and retard

and the Birth, the easier, and more successfull proves the delivery.

And therefore there are chiefly two sorts of Unnatural Births; namely when the *fetus* is either *born before*, or *after the time* allotted by nature: (and this is a kinde of Abortive Birth) and the Birth proves difficult and painful, because it doth not succeed in that manner, and order as it ought to do: or else is hindered by some bad *Symptomes*: which cometh to pass chiefly for two reasons: namely, in that the Mother doth faile in her expulsive office, or else that the *Fetus* is himself but sluggish, and so doth not promote his own release: for a facile and natural delivery relieth upon the endavour and joint furtherance of both parties.

Fabricius doth ascribe the work of bringing forth to the *Uterus*, to which performance, saith he, the *Muscles of the Lower Belly*, and the *Midriffe* are assistants. But when I consider the matter thoroughly, the throws of the woman in travaile do seem to proceed from the Motion and Agitation of all the Body, (just as we find it in Sternutation.) I knew a young Woman, which by reason of her extream torment in her travaile fell into a Sowne; and became instantly so consternated, stupid, and sleepey, that nothing could recover her. I being called in to her cure (finding that *Clysters*, and other proper remedies had been applied to no purpose, and that nothing could go down her throat) I put up a feather which was dipped in a strong *Sneezing medicine*, into her *Nose*; by which being moved (though she was so overwhelmed with a deep stupidity, that she could neither *sneeze*, nor be *awaked*) she began to be seized by a kind of *general Convulsion*, all her *body* over, which beginning

ning at the *shoulders*, did by degrees extend it self to the *lower parts*. But as often as I applied this *provocation* to her, her delivery was advanced and came on, and at last, the Mother being insensible of it her self, and remaining still in her sleepy condition, a healthy and sprightly Child was *born* into the world.

We may observe the manner of their *throws*, in other *Animals*: (as in the *Ewe*, the *Bitch*, and in great *Cattel*) wherein we shall discover that it is not by the *sole action* of the *Uterus*, or *Belly* either, but is the joint conflict of *all the whole body*. And how much the *Fetus* doth conferre to the *acceleration* and *facilitating* of his owne *Birth*, is chiefly evident in *Oviparous Creatures*: for it is apparent that the *Fetus* it self, and not the *Mother*, doth break through the shell. By which it is probable that in *Viviparous births* also, the chiefest cause of being born is owed to the *Fetus* it self, and that, to his industry and indeavour, and not to his weight, as *Fabricius* conceiveth. For what doth the weight thereof conduce to the birth in *four-footed beasts* which stand upright, or sit down; or in *Women* which lye along? nor doth the endeavour of the *fetus* proceed, as he suppoeth, from its largeness of bulk, or the plenty of the water, (the *Water* indeed is the cause of the *delivery* of the *fetus* which is dead and putrified in the *womb*, in that by its *corruption* and *acrimony* it doth extimulate the *Uterus* to relieve it self) but the *fetus* himself sets open the *Gates* of the *Womb* with his head turned downward, and unlocks their inclosure by his own force, and so struggleth himself into the world by *conquest*: And therefore that kind of *birth* is counted the nimbler and more fortunate. But when the *Child* comes into the world

thrusting

thrusting his feet foremost, saith Pliny, the birth is counted unnatural, and those that are so born are called *Agrippæ*, quasi *ægre parti*, born with much difficulty: For their birth is slow and painful. And yet notwithstanding in abortment, and where the *fetus* is dead, or that there would be a hard delivery any other way, so that there is necessity of handy-work in the business, the more convenient way of coming forth, is with the feet foremost; for by that means the streights of the *Uterus* are opened, as it were by a *Wedge*. Wherefore when the hope of delivery relieth chiefly upon the *fetus*, (as being strong and lively) we must endeavour to further his coming out with his head foremost; but in case the task is like to depend upon the *Uterus*, we must procure his coming out with his feet foremost.

That the assistance of the *fetus* is chiefly required in the birth, is evident, not in *Birds* onely, which do by their own industry without the help of their *Parent* break up the shell; but also in other *Animals*; for all *Flies*, and *Butterflies*, doe perforate the little membranes (in which they did lurk when they were the Worme *Aurelia*) and likewise the *Silk-worm* doth at his appointed time mollifie and erode the little *Silken bagge*, which he had weaved for his defence and security, and so gets out without any forraign aide. And in like manner, *Wasps*, *Beetles*, and other *Insects*; and all *Fishes*, are borne without others helps; as doth chiefly appear in the *Raie*, the *Fork-fish*, the *Lamprey*, and all cartilagineous *Fishes*, which do conceive their *Egges* within themselves, and those perfect ones, and party-coloured, (being furnished with a *Yolk* and *White*) and concluded in a strong cartilagineous quadrangular

gular shell: out of which being detained within the *Belly* and the *Uterus*, they do form their young; which breaking open the shell by force, do get abroad: as also the young *Vipers*, by their erosion of the *membrane* which containeth the *Egge*, do sometimes in their *Mothers Bowels*, and sometimes as they stick in the very passage, and other times at the end of two or three daies after their *nativity*, expose themselves to the wide *World*. From whence that Fable, that the *Vipers* do eat their way through their *Mothers bowels*, and so revenge the death of their *Father*, took its foundation: When yet they do no more then all other *issues* which come into the world, breaking through the membranes which encompass them, either in their very *Birth* it self, or a little after it.

But how great furtherance the *fetus* doth conferre to its own *Birth*, several observations doe clearly evince. A certain *Woman* here amongst us (I speak it knowingly) was, (being dead over night) left alone in her *Chamber*: but the next morning an *Infant* was there found between her *Leggs*, which had by his own force wrought his release. *Gregorius Nymmanus*, hath collected certaine examples of this nature out of approved *Authors*.

I also knew a *Woman*, who had all the interior part of the neck of her *Womb* excoriated and torne, by a difficult and painful delivery: so that her time of *Lying in* being over, though she proved with Child againe afterward, yet not onely the sides of the *Orifice* of the *Neck* of the *Womb* nor the *Nympha* did close together, but all the whole *Cavity* thereof, even to the inner *Orifice* of the *Matrix*, whereby there was no entrance even for

for a small probe, nor yet any egress to her usual fluxes. Hereupon the time of her delivery being now arrived, the poor soul was lamentably tortured, and laying aside all expectation of being delivered, she resigned up her keys to her Husband, and setting her affairs in order, she took leave of all her friends. When behold, beyond expectation, by the strong contest of a very lusty Infant, the whole tract was forced open, and she was miraculously delivered; the lusty Child proving the author of his own, and his Parents life, leaving the passage open for the rest of his Brethren who should be borne in time to come. For, proper applications being administered, his Mother was restored to her former health.

I shall adde one example more memorable then this. The Queen had an exceeding white Mare, excellently shaped, presented unto her: whose genitall parts (lest by going to Horse shee might endanger the beauty of her proportions, and become unfit for use) were, as the custome is, locked up all with iron rings. Notwithstanding which, this Mare (by what accident I cannot tell, nor could the Groomes inform me) was made big with Foale: and at last, when they feared no such matter, she foaled by night, and the Foale was found alive next morning by the mares side. When I came to heare thereof, I went presently to the Stables, and saw both the labia of the lap, which were locked up with rings, and all the privity towards the left side, so torne and dilacerated from the right haunch-bone, that the unity of that most tight part being dissolved, by the incredible force of the young Foale, hee might easily finde a passage through that wide gap. So forcible is the vigour and efficacy of a mature and lively Fetus.

But

But on the contrary, in case the *Fetus* be sickly, and languishing, or borne before its time; it is not properly a *birth*, but an *abortion*: and the *Fetus* is rather *ejected*, then *borne*: and therefore though he be now some dayes old, he will neither take the *breast* kindly, nor depofite his *excrements* as he ought to doe.

And yet the *Uterus* hath its share in this business of *Delivery*: as shall appear in the following example. A poor woman, who was a *Laundress*, did for a long time labour under the *Bearing down*, or precipitation of her *wombe*, and the *sheath* thereof did hang down to the bigness of ones *fist*, and at length, using no applications to it, her grief grew so forcible upon her, that it now begun to resemble a *Scrotum*, the skin being rugged and squalid; and yet found now less paine or trouble in it, then she was formerly used to find, when it newly bore down. But, she asking my advice, I counsell'd her to keep her *Bed* for some certain dayes, and to mollifie the dryer parts thereof with *fomentations*, and *oyntments*, and so when her *wombe* was reduced into her body, to keep it still up with *peffaries* and *swathes*, till by the use of drying and strengthening remedies it was confirmed and settled in its proper place. The cure did for some time succeed to our wish; but she being poor, was fain to fall to her calling again, to get money, and so intermitting her appointed *applications*, she fell into a *relapse*, and endured it pretty well, her *wombe* sometimes retiring back again, and sometimes continuing quite out; but for the most part, at night she did reduce it, and there it remained for some time. But after many dayes, she addressed her self to me again, complaining that her

wombe

wombe being swelled by the use of her remedies, and especially of her *fomentations* (as she conceived) would now no longer abide in her body. And yet applying some *oyntments* which I had prescribed, she had forced it in againe, but her cure did not continue long : for no sooner did she rise, and stand upon her leggs, and so goe about her work, but her *wombe* did presently, by reason of its *bulke* and *weight*, disturbe her againe, and would easily beare downe upon any occasion. And now at this time it was as large as a *Bulls Cod*, dangling between her leggs, : so that I suspected, that not onely the *sheath*, but that the *womb* it selfe was now inverted, or else that shee was diseased with a *Uterine Hernia*, or *rupture*. It grew at last bigger then a *mans head*, being then a hard tumour, and hanging downe to her *knees* did much pain her, so that she could not goe (but upon all foure) and breaking just in the bottom of it, it did effund a moisture (as if it had been an *Ulcer*) and blood with it. Looking upon it (for I did not explore it by touch) I did suspect it to be a *Cancer* of the *wombe*, and therefore did bethink my selfe of a *Ligature*, and cutting it off : and in the interim, I advised her to apply gentle *fomentations* to it to assuage the paine. But the following night, an *Infant* perfectly shaped, of a span long, was cast out of that *Tumour*, but it was dead; and the next morning they brought it to me; which having *embowelled*, I kept swimming in cold water without corrupting for some moneths time, shewing it to many of my friends (as a miraculous spectacle.) The skin in this *Fœtus* was not yet formed; but onely a thin paring appeared (such as lieth about a *Codlin*) which I easily drew away whole and entire;

ture ; whereupon all the *muscles* disclosed themselves very distinctly, (for the *Fetus* was leane.) What other matters I observed in the dissection of this *Fetus*, shall be related elsewhere : in this place, I thought it onely convenient to signify, how the *Matrix* it self alone did promote this *Abortive*, and did eject this *Fetus* by its owne industry.

De form.
fæt. pag.
142.

Fabricius doth propose two things worthy admiration (as he saith) in the *birth*, and after it : the first is concerning the dilatation of the *Uterus* in the *Birth* : and the other is, of the reduction of the *Uterus* after the *Birth* into its former compass and narrowness : Wondering that the *womb* should be so much distended to make way for the *fetus*, and that in a short time after delivery, it should retire into its pristine dimension.

How the Neck of the *Womb*, which is thick, hard, and so shut up, that it will not admit a slender probe, should subscribe to so vast a distention in the time of *Delivery*, We may with *Galen* L. 15. c. 7. admire, saith he, but we shall never comprehend it. pag. 143.

Yet he gives this Reason for it, namely That the *Uterus*, while it is not pregnant, is a thick and hard body, so likewise is its orifice ; but being impregnated, it becomes soft and thin : and the nearer it drawes to delivery, so much the more is the substance, and by consequence its orifice too, made thinner, and softer. And this he conceiveth to be effected by its distention ; which being distended, its compact and complicated body (if he may so speak) is expanded and smoothed, and so, though it was thick and hard before, yet now it is rendred thin and soft, and so consequently fit to afford an exit to the *fœtus*. And afterwards he saith, There was one, who once enquired of me, how, if it be so indeed, it can be true that in wo-

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men with childe the orifice of the womb is so occluded, that not so much as a small probe can get into it? I make answer, that it came to be so, in that the womb while it is distended, and is unfolded like a linnen cloth that is compacted and folded up together, doth begin to be raised up first in its upper part, and there to be unfolded, and after it the lower parts do by degrees begin to distend, till at the last that distending faculty doth arrive at the very orifice of the womb itself; which is convenient to be so then, when the Uterus is inclining towards delivery. Wherefore the Orifice of the womb is deservedly shut for the first months, (whilest it is crass and obdurate) but in the last dilated. And thus much touching Galens unknown cause: we might also adde other Reasons, whereby the dilatation of the womb becometh more easie, as, suppose, the Excrements of the Fœtus, namely the Sweat and the Urine: which though they are contained in their own proper membranes and receptacles, yet may the power of Humectation arrive even unto this Orifice, especially since it is placed below, and neer to these humours, being alwaies present with them. Adde also moreover, that a certain mucous and pituitous substance is alwaies found about the orifice of the womb.

But, in my opinion, this worthy man is mistaken; for the Neck of the womb is not hard by complication, but of its own essence, and nervous constitution: and likewise, those accidental Causes (which he alledgeth) are of little advantage to this purpose. For, doubtless, this is done by the Divine Providence of Nature (as well as the rest of the wonderfull Fabrick of the Body) which doth direct her workmanship to a certain End, Action, and Use. The Wombs constitution therefore is such, that in the first Conception it

should have its nervous Orifice constringed, for retention sake, which afterwards in the delivery of the *fetus* (like the fruit in the Tree) doth of hard become soft and mellow, for the convenience of *expulsion*: and that not from any *unfolding*, but from the alteration of its Temper; for even the connexion of the bones themselves, namely the *Synchondrosis* of the *Haunch-bone* with the *Share*, and *Holy-bone*, & the *synneuresis* or natural union or co-alition of the *Rump*, or utmost end of the *Os Sacrum* is dissolved and mollified. It is indeed a wonderfull thing, that the little bud of a growing Nut (as suppose of the Kernel of an *Almond*, or other Fruit) should break those bones which a Male can hardly bruise: and that the tender fibers of the *Ivy-root* crawling along the narrow chinks or crannies of stones, should at last demolish large walls. But it is nothing so wonderfull, that the genital parts of Women which are relaxed in the birth, should afterward harden, and draw themselves together, because it is natural to those parts; especially if we consider that the *Yard* of the Male is in coition very much stretched, and hardened, and anon doth flagee, and soften. We are more to admire (which is beyond all plication or folding) that the substance of the *Uterus* is not onely daily amplified and distended, according to the growth of the *fetus*, (as if it were, according to the opinion of *Fabricius*, unfolded) but doth grow thicker, more carnos, and stronger then before. That indeed is more wonderfull; yet, as *Fabricius* admireth it, that the so large bulk of the *Uterus* should in so few dayes space, by the customary purgations of *Child-bed*, return to its pristine dimensions: since it is not so in other humours and impostumations: which consisting of

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præternatural, and *digestive faculties*, which rebell against the *expulsive*, are longer under cure. And yet this is no more admirable, then the other works of *Nature*; for all things are filled with the *Deity*, and the God of *Nature* displayeth himself in all things.

In the last place, *Fabricius* doth most admire, that those *Vessels* of the *Embryo* (namely the *Oval perforation* out of the *Hollow-vein* into the *Venal Arterie*, and the passage from the *Arterial Vein* into the *Aorta*; (whereof we have treated at large, in our *Traët of the Circulation of the Blood*) should presently after the *birth* wither, and be *obliterated*, and is enforced to betake himself to that reason cited by us before out of *Aristotle*; namely, that all parts are constituted for some *Action* or other, and that *Action* being taken away, the parts also themselves do vanish. As the *Eye* seeth, the *Eare* heareth, the *Braine* perceiveth, the *Stomack* concocteth; not because they are endowed with such a kinde of temper and fabrick; but those *organs* are therefore endowed with such a kinde of temper and fabrick, that so they may perform the *Functions* assigned them by *Nature*. Depart. ani
l. 1. c. 5.

By which argument it appeareth, that the *Uterus* is the chiefeſt of the *Parts* dedicated to *Generation*: for the *Testicles* are constituted for the *geniture* or *seed*; but the *seed* for *coition*; and *coition* it self, or *emission* of *seed*, that the *Uterus* may receive *fecundity*, and so *generation* ensue thereby.

We have formerly said, that the *Egge* is as it were the *fruit* of *Animals*, and as it were an exposed *Womb*. Now on the contrary, we shall contemplate the *Uterus* as an *Egge* residing within. For as *Trees*, at set times, do flourish with *leaves*, *flowers*, and *fruits*: and *Oviparous Animals*

do sometimes generate eggs, and lay ; but sometimes they grow emerit, and the place or part which did contain them is not to be found : so also *Viviparous Animals* have their *Spring*, and *Autumne*. At the Seasons of *fecunditie* and *generation*, the Genital parts, especially in Females, are very much altered : insomuch that the *Ovary* in *Birds*, which at other times is conspicuous, doth then appear something turgid : and the *Belly* of *Fishes*, about the time of *Spawning*, doth much exceed all the rest of their *body*, by reason of the multitude of their eggs, and affluence of their seed or *spawn*. In many *Viviparous Animals*, the Genitals (namely the *Uterus*, and *Spermatical Vessels*) are perceived to be at some times of a diverse Constitution, Temper, and Fabrick ; but as they grow pregnant, or forbear to be so, so do they diversly change ; so that a man can hardly know them for the same things. For as in Nature nothing is wanting, so there is no superfluity. And therefore the Genital parts, when there is no more use of them, do wither, are retracted, and as it were obliterated and expunged.

At the times of *Coition*, the *Testicles* are conspicuous in *male Hares*, and *Moles*, and the *Hornes* are then visible in the *Uterus* of their *females*. It were strange to relate, how great an affluence of seed is then conspicuous in the larger sort of *Moles*, and *Mice*, in which at other times no seed at all is to be seen (but their *Testicles* are extenuated and retracted into their Bellies) but when they forgoe *impregnation*, there is hardly any such thing as a *Uterus* to be perceived : insomuch that it is a difficult matter to distinguish Male from Femal.

The *Womb* doth, chiefly in *Women*, exceedingly
vary

vary both in Temper, as also in those Adjuncts which follow the Temper (namely Scituation, Magnitude, Figure, Colour, Thickness, Hardness, & Density.) Unripe *Virgins*, as their *Breasts* are no bigger then the *Breasts* of *Boyes*; so is their *Uterus* very small, white, of a skinny substance, destitute of Veines, and in magnitude, not exceeding the top of ones *Thumb*, or a large *Bean*. So also antient *Women*, as their *breasts* do sink, so have they a retreated, flaggy, lank, pallid *Womb*, void of Veins and Blood. Which I also conceive to be the cause, why *Women* growing Antient have not their monthly *Termes*: but that they descend into the *Hæmorrhoides*, or else do abruptly forsake them, and so endanger their health. But when the *Womb* is now *chill*, and as it were *defunct*, & all the Veins and Arteries thereof are expunged, the *superfluous blood*, when it boileth, doth either restagnate, or divert its course into the neighbouring *Hæmorrhoids*. But on the contrary, in *pale Virgins*, and such as have the *Green sickness* (whose *Womb* is slender, and their *Terms* are at a stay) by Coition with the Male, saith Aristotle, *the excrement of the Terms is drawn down, for the Uterus being tepefied, doth attract the humours, and the passages are opened.* Whereupon a vast abatement of their distemper doth ensue: for the *Womb* being unmindefull of his function, many mischiefs do befall the Body in general: because the *Womb* is a principal part, which doth easily draw the whole body into consent with it. No man (who is but never so little versed in such matters) is ignorant, what grievous *Symptomes*, the Rising, Bearing down, and Perversion, and Convulsion of the *Womb* do excite; what horrid extravagancies of minde, what Phrensies, Melancholy Distempers,

De gen. an.
l. 3. c. 1.

and Outragiousness, the *praternatural Diseases* of the Womb do induce, as if the affected Persons were enchanted : as also how many difficult *Diseases*, the depraved effluxion of the Terms, or the use of *Venus* much intermitted, and long desired do foment. Nor is it less known, how great an Alteration doth befall *Virgins*, when their *Uterus* doth enlarge, and is tepefied, for they grow mature, and their Complexion doth improve ; their Breasts strut forth, they become more beautifull, their Eyes glisten, their Voice is more tunable, their Gate, Gesture, and Discourse, are more gracefull then formerly ; and their more grievous *Distempers* are at this time, or never, cured.

I knew a noble Lady, which was wilde by reason of a *Uterine Melancholy* and *Distemper*, for above ten years together : and when all *Remedies* had been in vain employed, she fell at last into the Bearing down of the *Uterus* ; which accident, contrary to others judgement, I did prognosticate would conduce to her health ; and perswaded her not to return her *womb*, untill its distemper was asswaged by the outward *cold aire* : the success was answerable to my perswasion, and in a short time she was perfectly cured ; and her *womb* being at last restored to its seat, did remaine there, and she lives a healthy life, even to this day.

I knew another *Woman*, which was troubled with *Hysterical symptoms*, such as no Applications could subdue ; who at length after many yeares was cured by the Bearing down of the *Womb*. And both these being relieved in their *Symptoms*, I did restore their *wombs* to their places with happy success. For the *Uterus* being by any sharp *humour* excited violently to expulsion,

expulsion, doth not onely gently bear down, but (like unto the *Right Gut* when it is irritated by a troublesome *Tenesmus*) doth precipitate it self outward.

Divers therefore is the *Constitution* of the *Uterus*; and that not onely *præternatural*, but *natural* also, namely, in the time of *Fecundity*, and *Barrenness*. In young *Girles*, and *Women* past *Childing*, it is (as I have said) of the magnitude of a *Bean*, and without any blood: in a *Virgin* ripe for a husband, it resembleth the bulk and form of a *Pear*: in fruitfull *Women*, and such as are apt to conceive, it is as large as a small *Gourd*, or a *Goose-egge*; and doth likewise swell as the *breasts* do, and growing more laxe and fleshy, it becometh warme; and as *Virgil* speaketh of the *Fields*,

——superat tener omnibus humor,
——& genitalia semina poscunt:

They all a flowing moisture have,
And so a fruitfull seed do crave.

* Wherefore their *Terms* being now at hand, or newly over, whilst the warmth and moisture of the Part (which are two necessary causes of *Generation*) do remain, *Women* are most apt to conceive. And so other *Animals* likewise (when they are excited to *Venerie*) their *Genital* parts are moist, turgid, and swelled.

And this *Constitution* I have found in the *Womb*, before the *Birth*. But in *Women* with *Child*, the *Uterus* (as hath been said) doth extend according to the growth of the *Infant*, and so enlargeth into a vast proportion. I have found it presently after *Delivery*, of the bigness of ones head, and

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thicker then the *middlefingers* breadth, and fraught with diverse vessels full of blood. It is indeed a wonderful thing, and (as *Fabricius* noteth) doth much exceed our humane apprehension, that the so vast bulk of the *Uterus* should so much lessen, in so short a space, namely in the space of fifteen, or twenty days.

For no sooner is the *fetus* and the *After-burden* excluded, but the *Uterus* doth by degrees gather it self together, streighteneth its Neck, and retreateth it self towards the *interiour parts*; being partly insensibly abated by a *diaphoresis*, and partly dissolved into the *Purgations*: and all the bordering parts, the *bones*, *belly*, and all the *Hypogastrical region*, are together contracted, and grow firme againe. In the *Purgations*, first of all *pure blood*, then *corrupt blood*, like that *Water* wherein *flesh* that is newly killed is *washed*, and then *paler blood* doth issue forth: our women doe call it *lactis proventum*, the coming of the *Milke*, when their *purgations* are now no longer died with *blood*; because perhaps, the *Milk* doth at that time flow more plenteous, and sound for the *Infant*, from the *breasts*; and the *purgations* do then begin to diminish, and dry away: the *alible juice* being now translated from the *Uterus* to the *breasts*.

And yet other *Animals* do not require so great trouble in the business, for the fore-said parts in them are, in the compass of a day or two, quite restored, and perfectly consolidated. Nay some of them (as the *Hare*, and the *Coney*) in the space of an hour after they have kindled, do admit the *Buck*, and are again fructified by *Coition*. As we have shewed that the *Hen* so soon as ever she hath layed, is compressed by the *Cock*. But *Women* alone,

lone, as they onely have *Termes*, so do they abound with *after-purgings*, and do alone undergoe difficult and *hazardous deliveries*: because their *Uterus* doth either unseasonably gather it self together, by reason of weakness, or else the *After-purgings* are depraved contrary to nature, or do not come away kindly. For it often befalls *Women* (especially the more tender sort) that the *After-purgings* being corrupted, and grown noisome within, do call in *Feavers*, and other grievous *Symptomes*. For the *Womb* being excoriated by the separation of the *After-burden* (especially if the separation were violent) like a large inward *Ulcer*, is cleansed and mundified by the liberal emanations of the *After-purgings*. And hereupon we conclude of the welfare or danger of a *Woman in Child-bed*, according to her excretions. If any part of the *After-burden* be left sticking to the *Uterus*, the *After-purgings* will flow forth evil-sented, green, and as if they proceeded from a dead body: and sometimes the courage and strength of the womb being quite vanquished, a suddaine *Gangrene* doth induce a certain death.

In case any *Clotted Blood*, or any other *preternatural matter*, do remain in the cavity of the womb after the *Delivery*; the *Womb* will neither retire upwards, nor close its *Orifice*, but its *Neck* will continue soft and open: As I have had experience in a *Woman*, which lying very sick of a *Malignant Feaver*, and being very weak, did suffer an *Abortion*: who after the exclusion of the *Fetus*; which was incorrupt and entire, yet lay exceeding weak with a disorderly *Pulse*, and in a cold sweat, as if she were a dying. I perceived the *Orifice* of her *Womb* was lax, soft, and very open, and her *After-purgings* were something noisome: whereupon

on I suspected that something did lurke in her *Womb* which did putrefie : and putting in my hand, I extracted a *false Conception*, as bigge as a *Goose-egge* ; which was made of a most *thick, nervous*, and almost *gristly substance*, having some perforations in it : (whereout did issue a viscid and putrefied *matter*) and immediately upon this she was discharged of those greivous *Symptomes*, and suddainly after did perfectly recover.

When the *Neck* of the *Womb* doth a litle contract it self, and thereupon the *Clotted Blood* doth get out, though not without pain and difficulty, causing those paines, which our Midwives call the *After-throws* : the danger is then supposed to be over, and indeed it is usually so ; because it is a signe of the strength and firmness of the *Uterus*, collecting it self easily together ; whereby the *After-purgings* are more readily expelled, and the *Woman* is the sooner well.

But I have known the *Orifice* of the *Womb* draw together so close in some immediately after the *delivery*, that the *Blood* being deteined in the *Womb*, and thereupon suddenly putrefying and thickening into *Clots*, did induce most greivous *Symptomes* ; and when no means would avails to unburden them, a present death ensued.

A very Honourable Lady in *Child-bed* falling into a *feaver* (by reason no *After-purgings* came from her) had her *Privities* swoln, and scorching : the *Orifice* of her *Matrix* being hard, and shut up, I did open it a litle way by force with an *Iron Instrument*, that so I might immit an *Injection* by a litle *Syringe* ; whereupon black, clotted, and noisome *blood* did issue out, even to some certain pounds weight, whereby she received present ease.

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The Wife of a *Doctor of Divinity*, who was of a good habit of Body enough, but being *Barren*, did consult me ; and being very desirous of *Children*, she had tried many Medicines, and Physicians, but all to no purpose : she had her *Termes* at the usual times ; but sometimes (especially when she had rod on Horse-back) some corrupt and purulent substance did issue from her : Which presently after would stop again. Some conceived it to be the *Whites* : others suspected it to be some deep *Ulcer* : being perswaded thereunto, chiefly, because her flux was not constant, and by litle and litle, but by certain *Intervalls*, and much at a time : Whereupon by the help of a *Speculum Matricis* they did survey all the sheath of the *Uterus*, and did apply several Medicines, but all in vain. At last I, being called, did open the inward Orifice of the *Womb*, and presently there did issue forth to the quantity of two spoonfulls, of corrupt matter, sprinkled with bloody streaks. Which when I perceived, I told them that there lay an *Ulcer* lurking in the cavity of her *Womb* ; and by injecting proper Medicaments, I restored her to her former health. But being intent upon the cure, and seeing the ordinary remedies did litle availe, I applied more forcible ones ; because I suspected that the *Ulcer* was inveterate (and perhaps with flesh growing upon it) wherefore to my former injections, I added a litle *Roman Vitriol* ; by whose acrimony the *Uterus* being extimulated, did grow so hard, that it did seem as hard to the touch as a *Stone* : and occasioned several *Hysterical Symptoms* withall ; which Physicians commonly conceive to proceed from the suffocation of the *Matrix*, and foul vapours being thence sent upwards. This inconvenience continued a while ; till the

Uterus

Uterus being asswaged by milder applications, and such as abate pains, did relax its *Orifice* againe, and did exclude the *sharp liquor* which I had injected, together with a putrid matter. Whereby the *Patient* was in a short time restored.

I conceived it convenient to transerre this *History* out of my *Medicinal Observations*, to this place, that it may evidently appear, of how sharp and quick a sense the *Uterus* is: and how easily it doth close it self upon the presence of its adversary: especially in a *greivous* and *difficult Lying in*. Now these casualties are most incident to *Women* above all other *Creatures*, and of them, to those that are tenderly brought up, and doe lead a *sedentary* and *lazy life*; as also to such as are of a *sickly constitution*, and do easily fall into distempers.

For *Country Women*, and such as take great paines, are not so dangerously ill, upon so smal grounds. Some of these will be with *Child* again within a moneths time: when as the other are often out of order for two years after.

De fetu.

*com. in
hist. an.
Arist. l. 7.
c. 3.*

Hippocrates allotteth as many daies for the *Afpurgings*, as for the formation of the *fetus*; and therefore more for a *female*, then a *male Child*. But that, witness *Scaliger*, is false: For none of our *Women* are purged above a moneth after their delivery: many not beyond fifteen daies: and some but seven: nay I have known a *Woman*, who was cleansed in three days, even after she had brought forth *Twins*. *Galen* hath many things concerning this subject, in his Book *περί νουμίσαν*. The *Women* (as the report goeth) in the *New-found Land*, keep close the day of their delivery; but the next day returne to their ordinary employments.

I will

I will onely adde, for conclusion, a memorable relation, delivered to me from the Noble Lord *George Carew*, Baron of *Tatnes*, and for a long time President of *Munster* in *Ireland*, who also wrote the *Annals* of those times. There was a Woman bigge with Child, which followed her Husband, who was a Souldier in the Army; and the Army being daily in motion, was it seemes forced to make a Halt, by reason of a litle River that run cross the place whether they intended to March: whereupon the poor woman finding her labour come upon her, retired to the next thicket, and alone by her self, without any Midwife, or other preparation, brought forth Twins: which she presently carried to the River, and there washed both her self and them; which done, she wrapt her Infants into a course cloath, and tied them to her back, and that very day, marched along with the Army twelve mile together, bare-footed: and was never the worse for the matter.

The next day after, the Deputy of *Ireland*, the Lord *Montiory* (who at that time was *General* of the Army against the *Spaniards*, at the siede of *Kingfale*) and the President of *Munster*, being affected at the strangeness of the story, did both vouchsafe to be God-fathers to the Infants.

*Of the Membranes and Humours of
the Uterus.**Lib. de for.
fœtus c. 1.*

Hieronymus Fabricius recounteth four sorts of bodies, which do consist without the Fœtus, namely the Umbilical Vessels, the Membranes, Humours, and fleshy substance. Concerning which, I shall briefly declare, wherein I differ in opinion from him, (by the instigation of several Observations) but first I shall succinctly lay down his opinion.

There are, saith he, three Membranes, two whereof do encompass the Infant throughout, but the third doth not. Of those which do encompass the Fœtus, one is the interiour, called *α'μνιον* id est, amnion, the little covering. The other is placed next to the former, and called in Greek *Χορίον*, in Latine, Innominata, the coat without a name (but it is by Interpreters falsely called *Secundæ*, or *Secundina*, the *Secundine*) and this also doth encompass the whole Fœtus. The third is called *α'νταρριονιδης*, id est, Intestinalis, the Gut-like Membrane, because it is like a stuffed Gut, or Pudding: which therefore doth not encompass the Fœtus, but lieth over part of the breast and lower belly, and is extended to each horn of the Uterus. He doth confess that this Membrane is onely to be found in a Lamb, and a Calfe; and saith that it is joined to the Uterus, and doth by the *Urachus* receive the Urine of the fœtus from the Bladder. And therefore, saith he, In Horned beasts, which have this coat called *Allantoides*, the *Urachus* is so large, and strait, that it resembleth a Gut; growing by degrees lesser and lesser, even till it reach to the bottom of the bladder: which doth easily evince

that

that its original is rather from the Allantoides, then from the Bladder. But in a Man, and other Animals which have teeth in both Jaws, the fore-mentioned largeness of the Urachus is so small, that where as it riseth single from the bottom of the Bladder, it is presently after divided into most slender fibers, which passing along with the Umbilical Vessels, do transfund the Urine into the coat Chorion (in an almost invincible manner.) And upon this ground he doth challenge Arantius of a double error; both in that he denyed any Urachus to be found in a humane fetus; and likewise for saying, that it doth discharge its Urine through its privy member.

But for my part, I confesse my self to be involved in the same errors with Arantius (if at least they be errors.) For I am sure of this, that if you compress the bladder of a large-grown fetus, (be it the humane fetus, or of any other Animal) the Urine will start out at the Privities. But as for the Urachus, I never yet saw any such thing, nor could ever observe that upon compression of the bladder, the Urine would gush out into the Secundines. I have indeed in Sheep and Deer, seen a certain Process of the bladder, which doth contain Urine in it; but never saw any such as the Urachus by him described.

And yet I will not too stiffly deny, that there is a Coat called Allantoides; for the Interior membranes are so thin and transparent, (such as wee have signified to be found between the two whites of an Egg) that they may easily impose upon the Eye. Likewise in a Hen-egg, between the Colliquamentum and the White (that is, between the Amnion, and the Chorion) there is to be seen some whitish excrements, nay, sometimes the very downright excrements of the Guts; as we have formerly

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ly spoken, and Coiterus hath also observed. Moreover, the *Membrane* of the *Colliquamentum* it self (wherein the *Chicken* doth swim) though it be pellucid, thin, and so subtle, that (according to *Fabricius* his own confession) thinner cannot be imagined: yet (since according to *Him*, all the *membranes* though never so thin, are nevertheless double) Nature may possibly sometimes upon necessity deposit the *Urine*, or some other *excrement* between the *Reduplications* or *folds* thereof. And such a kinde of *Allantoides* as this, I shall willingly indulge to *Fabricius*: but as for any other kinde of *Pudding*, carried on to both the *bornes* of the *Womb*, I finde no such thing in the *Secundines* of *Cloven-footed-beasts*, nor any thing else, but the *Conception* it self. I onely finde, (as I have said before) a kinde of *Process* of the *bladder*, which being seated between the *Umbilical Arteries*, doth contain an *excrementitious humour*, and this *Process* is in some longer, and in others shorter.

Wherefore, in my judgment, the *Coat* which *Fabricius* calls *Allantoides*, is the meer *Chorion*: and yet the *Antients* called it *Allantoides*, from the figure of a *double-pudding*, which it doth resemble. For the *exteriour membrane*, which (like a *Wallet* ryed in the middle) is extended to the *extremities* of each *Horn*; and passing through the interposed part of the *Uterus* (or the connexion of both the *Horns*) is fastened together, is the *Chorion*; which, in *Sheep*, *Goats*, *Hinds*, and *Does*, and other *cloven-footed beasts*, if you take it in your hand in the middle of that passage, you may draw it away entire: and this we have called their *Egge*, or *Conception*.

For it containeth as an *Egge* doth, a two-fold
liquor,

liquor, a *fetus*, and all things relating thereunto; and hath the same qualifications which *Aristotle* assigneth to an *Egge*; namely, that out of part thereof an *Animal* ought to be constituted, and that the remainder ought to become the support and sustenance of that *Animal*, when it is now constituted.

And therefore that Coat which *Fabricius* calleth *Allantoides*, I either conceive to be the *Chorion*, or that something præter-natural had befallne some *Animal* which he had seen. For certain it is, that it is onely to be found in some few *Animals*, and not alwaies in them neither: for at the Beginning it is not found, & afterwards, in some it is more, and in others less conspicuous, and in some nothing at all is discernable, but meerly a *Process*. And *Fabricius* himself conceiveth it not usefull to the encompassing of the *Infant*, but only to the reception of the *Urine*. And truly I believe, that he maketh mention of it, rather in justification of the Doctrine of the *Antients*, then that himself found any such thing, or thought it usefull to any intent. But (both with the *Antients*, and the whole School of *Physitians*) he doth confess, that the *Chorion* doth contain *Urine*; where hee saith, that two humours are about the *fetus*, the one being *Sweat*, which is in the *Amnion*, the other *Urine*, which is contained in the *Chorion*.

By which it is manifest, that the *Antients* understood one & the same membrane under a double compellation; namely; in cloven-footed beasts, (in whom alone it is found) they called it *Allantoides*, by reason of its figure: but in other *Animals*, they called it *Chorion*, from its employment, because they conceived it was designed for the entertainment of the *Urine*. And therefore they

confess that this *Coat* is neither found in a *Man*, nor any other *Animals*. For what need of any other *Coat* to entertain the *Urine*, when that office, by their own confession, is already executed by the *Chorion*? And indeed, there can no probable reason be alledged why that *coat* should be found in *Sheep*, *Goats*, and other *beasts* which cleave the *hoof*, and not also in *Dogs*, *Cats*, *Mice*, and *Others*. For if it were instituted for the reception of the *Urine*, it is necessary, that the *fætus* of *Sheep*, and *Cowes*, should either abound with greater plenty of *Urine* then other *animals* which have *Teeth* in both *Jawes*; or else, that there are three diverse kinds of *humours*; or at least two *Receptacles* of the *Urine*. For this I am sure, that the *Chorion* is from the first beginning full of *water*. But I do not here intend to dispute controversies, I shall rather rehearse what I have found by experience.

It is one thing to exhibit the *fabrick* of a *Conception*, or *Embryo* that is now perfected, as *Fabricius* doth: but another thing, to disclose the the *generation* thereof, and first *scheme* and *rudiments* of all: as it is a diverse business to describe *Apples*, or the *ripe seeds* of *Plants*, and their first *production* from the *bud*. We therefore will briefly relate, how the *Conception* is framed by little and little, even from the *beginning* to the *end*; that it may thence more likely appear, what we are to conclude concerning the *Membranes*, and other *Appurtenances* relating to the *Fætus*.

All Living things do derive their *Original* (as we have said) from something, which doth contain in it both the *matter*, and *efficient virtue* and *power*: which therefore is that thing, both out of which, and by which, whatsoever is born, doth de-

duce

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duce its beginning. And such an *Original* or *Rudiment* in *Animals* (whether they proceed from other *Animals* which do beget them, or else are *spontaneous*, and the *Issues* of *Putrefaction*) is a certain *humour*, which is concluded in some certain coat, or *shell*; namely, a *similar body*, having life actually in it, or *in potentia*: and this, in case it be generated within an *Animal*, and do there remain, untill it have produced an *Vnivocal Animal*, is commonly called a *Conception*: but if it be exposed without, by being born, or else assume its beginning elsewhere, it is called either an *Egg*, or a *Worm*. But I conceive that both ought alike to be called *Primordium*, the first *Rudiment* from which an *Animal* doth spring; as *Plants* assume their nativity from the *Seed*: and all these *Primordia* are of one kinde, namely, *Vital*.

And this kinde of *Rudiment* I finde in the *Vterus* of all *Viviparous Animals*, before any part of the *fetus* appear; namely, there is a *cleare, stiffe, white humour* (like the *white* of an *Egge*) which is included in a *membrane*, which I call their *egge*: and this doth fill up all the *Vterns*, and both the *Horns* thereof, in *Hindes*, *Does*, *Sheep*; and other *Beasts* which cleave the *Hoof*.

In process of *Time*, there is a most pure, and clear *watry part* distinguished or severed from the rest of the *Rudiment*, or *egge*, which we call the *Colliquamentum*, or dissolved part in a *Hen-egge*) and this doth in brightness or perspicuity farre exceed all the rest of the *egge* (in which it is comprehended. The form thereof is *round*, and it is concluded in its own proper *membrane*, which is most thin and transparent, which they call *Amnion*; as for the rest of the *humor*, which is thicker and darker then this, an *exteriour coat*, which is

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contiguous to the *concave superficies* of the *Vterus*, and embraceth the *whole Egge*, doth contain it: which obtaineth a *several figure*, according to the diversity of the *shape* of the *womb*: for in some it is *oval*, in other *oblong*, but in *Beasts* which cleave the *hoof*, it resembleth a *Wallet*.

A little while after, there doth appear in this crystal *Colliquamentum*, *Punctum rubrum saliens*, A Red leaping Point; from which most slender strings of little *Veines* are disseminated, like *rayes* or *beames*. Anon the first *concrement* or *substance* of the *Body* doth appear, like a *Magot*, which is bent like a *Keel* of a *Ship*: and so the rest of the *Parts* doe follow in their order, as hath been related in our *History*. For we have observed that the *Procreation* of the *fetus* in *Viviparous Animals* is instituted in the same manner out of the *Egg* or *Conception*, as the *Chicken* out of the *Henn-Egg*.

But these *Viviparous conceptions* do (as I have noted) differ in *Figure*, *Number*, and *Connexion* to the *Vterus*. For at the beginning, the *Conception* (especially in those that cleave the *hoofe*) doth not grow to the *Vterus*; but being onely contiguous thereunto, doth fill up all its *cavity*, and distend it, and may be easily drawn out whole.

In such *Creatures* as cleave the *hoofe*, (which do conceive in the *Horns* of the *Womb*) and also in those that are *whole-hoofed*, there is onely one of these *eggs* found at a time, and that also extending it selfe to both the *Hornes*, and though sometimes they do produce a *single*, and sometimes a *double fetus*; and thereupon have sometimes one *single Colliquamentum*, and sometimes two (namely, one in the *Right*, and another in the

the Left Horn) yet are they still concluded in that Common Egg or Conception.

But in other *Animals*, so many *fetus*, so many several Eggs are to be seen apart; and as many *Colliquamentums* in them, as it is in the *Dog*, the *Cat*, the *Mouse*, and such like *Animals* as have teeth in both their *Jawes*.

The Figure of the Conception in such as cleave the *boof*, is like a *Wallet*; namely such, as *Fabricius* doth attribute to the *Allantoides*. In a *Mare*, the internal shape of the *womb* resembleth a little oblong *Sack*; but in a *Woman*, it is *Orbicular*.

In those *Animals*, whose conception doth cleave to their *womb* (which, truly, is not so in many, untill the *fetus* be fully formed) it is distinguished by its Diversity of *Connexion*: for in some, it doth stick onely in one place, by the mediation of a *carnous substance*, which we call *Placenta*, the *Uterine cake* in *women*, because it resembleth the round figure of a *Cake*; but in others, it groweth to the *Uterus* in several places, being fastened thereunto by divers *fleshy substances*, or *caruncles*: namely, by five, in *Hindes*, and *Does*; by more in *Cowes*, but they are lesser also: but in the race of *Sheep*, by very many, and those of different magnitude. In *Dogs* and *Cats*, these *Carnous Bodies*, do (like a *girdle*) encompass every conception round. A like substance doth in *Hares*, and *Moles*, grow to the sides of their *Uterus*: as also the *Uterine cake* in a *woman*, which embraceth more then one half of the conception (as the cups do the *Acorns*, when they first spring) and therefore the gibbous part thereof doth stick fast to the *womb*, but the hollow part doth grow to the *Chorion*.

These things being premiss'd, we shall now disclose, what our judgement is of these *Humours*,

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membranes, fleshy substance, and also of the distribution of the *Vmbilical vessels* (which are spoken of by *Fabricius*.)

cap. 5.

Fabricius doth rightly understand by the words *Nutrix* and *Uterus*, the *Secundines*, or *After-Burdens*, namely not the *Membranes* onely, but all that which doth come away last in the delivery (or at least, not long after it) and is constituted of *humours*, *membranes*, and *fleshy substance*, as also of the *Vmbilical Vessels*.

Of the Humours.

But as for what he relateth concerning the humours, which as he supposeth he doth receive from the Ancients (as a thing most sure, and which standeth in no need of any proof) namely, that the water in the *Amnion*, wherein the *fetus* swimmes, is its sweat; and that that outward *Water* in the *Chorion* is the *Urine*, are both incongruous, and false assertions: For both those two humours do appear in the conception before any portion of the *fetus* it self be in being: and that which he calleth the *Urine*, is before that (which they conceive to be the sweat.) Nay you may find these humours, especially the last, in some barren, and unfruitful conceptions (wherein there is no tract of a *fetus* at all.)

De gen. gn.
l. 3. c. 9.
Ibid.

Such Conceptions as these, or *Subventaneous eggs*, *Women* do sometimes eject: and *Aristotle* saith they are called, *Fluxus*, *Emanations* or *Fluxes*, but we call them *false conceptions*, and *slips*. Such an egge as these, did *Hippocrates* shake from his aborting *Minstrel*. For those creatures which do breed an *Animal* within themselves, have in some sort after their first conception, something like an egge within them, for a humour is contained in a thin membrane, just as if you should pluck the shell off of the egge. But as for that humour contained in the *Chorion*, which

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Fabricius and other Physicians conceive to be the *Urine*, *Aristotle* seemeth to apprehend it to be the liquor of the *Sperme*, or *Geniture*. For, he saith, *Hist. an.*
The seed being received by the Uterus, having con- l. 7. c. 7.
tinued in it a while, is covered with a membrane.
For if it chance to fall out, before any dearticulation,
or delineation of the parts do appear, it looketh like
an egge covered with a membrane, when the shell is
pilled off. But that membrane is full of *Veins*, name-
ly, the *Chorion*, which hath assumed its denomi-
nation a *venarum choro*, sive *copia*, from the conflux
or multitude of veins.

I have often seen those kind of egges ejected in
the second, or third moneth: they are many
times corrupt and rotten within, and do steale
out insensibly (like the *Whites*) and so delude
those, who have entertained hopes of a true con-
ception.

Again, those fore-mentioned humours cannot
be conceived to be sweat, or *Urine*: because they
abound in such plenty at the very beginning, that
the *Embryo* swimming in the midst thereof, is
thereby secured (whilest his Mother runneth, or
danceth, or doth imply her body by any forcible
agitation) from the collision of the circumjacent
parts, as it were by a fortress.

Add to all this, that many *Animals* never sweat
at all: (when yet according to *Aristotle*, all *Wa-*
ter, *Land*, and *Volatile Animals*, and I shall put in
creeping things, and *Insects* also, whether they be
produced in the shape of an egge, or an *Animal*, or
else be spontaneous productions, are all procreated
after a like manner) all fowl, creeping things, and
fishes, are conceived neither to Sweat, nor *Urine*. *Ibid.*
The *Dog*, and *Cat*, do never sweat; nor any other
Animal, while it doth emit abundance of *Urine*.

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And certainly it is impossible, that any *Animal* should make *water*, before the *Reines* and *Bladder* are made.

Besides, which is a more evincing Argument then the rest, these *humours* cannot be *excrementitious*, because so many litle *filaments* of *Veins* are disseminated into them; which doe derive *Aliment* from thence (as from a large stock) and afterwards conduct it unto the *fetus*.

Againe, if the humour contained in the *Chorion*, be the *Urine*; what need is there of the *Allantoides*? and if the humour contained in the *Amnion* be the *Sweat*, why did nature, who is so exact in all her contrivances, order the matter so ill, as to condemn the *fetus* to lye wallowing in its own *Excrement*? and why doth the *Parent* presently after delivery (for that is usual with several creatures) devour that which is but the *Excrement* of her *fetus*, together with the *membranes* which contain it, with so much greediness and appetite? Some have observed, that if the *Animal* do not eat up these *membranes* and *humours*, it will not give down its *Milk* freely.

If, notwithstanding all these arguments, some men will still maintain that these *humours* (which we dispose to the nutriment of the *fetus*) are *excrementitious*; and that upon this inducement, viz. because they also improve according to the growth of the *fetus*: and that in the birth of some *Animals* (at which time the whole stock of *Aliment* is in probability almost consumed) great store of these *humours* doth abound; and that therefore they must needs performe other offices, then can well consist with the dignity of the nutriment. Yet for all this, I confidently pronounce, that these *humours* are the *Aliment* of the *fetus*
from

from the beginning of all; (as the *Colliquamentum* and the *White* do serve the *Chicken* for the same purpose) but in process of time, the thinner, and purer parts being exhausted, the reliques do then put on the nature of an *useful excrement*: and are reserved in some *Animals*, that so they may secure the *fetus* and facilitate the *delivery*. For as *Wine*, when the *Spirits* are exhaled, turns into *dead-wine*: and as several *Excrements* do result from the *reliques* of the *Aliment*: so in like manner, when all that *substance*, which is commodious to the *sustenance* of the *fetus*, is derived out of the humour concluded in the *Chorion*; the remainder doth turn into a kind of *excrement*, and is reserved for the *uses* aforesaid. But all that humour which was included in the *Amnion*, it commonly spent neer the approaching *delivery*; so that it is probable, that the *fetus* desireth to get out by reason his provisions faile him.

Lastly, if at any time there be any other humour contained in the *Allantoides* (as indeed there sometimes is) I esteem it to be a *preter-natural humour*. For I have seen when women at their *delivery* have had a mighty flux of water; and sometimes a two-fold water: our Midwives call them the *By-waters*. And therefore some women have a monstrous great belly, though they are brought to bed of a very litle & lean Childe; but such women do effund abundance of *Waters*. Some are of opinion, that the larger quantity of *Waters*, doth accompany weakly, and those *female Children*: but the lesser, strong, and *male Children*. I have often seen waters burst forth in the midst of the going with Child without Abortion, the Child remaining safe, and strong even to the birth. As therefore there are naturally
but

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Of the
Mem-
branes.

but two *Waters* only, (whereof the one is contained in the *Chorion*, and the other in the *Amnion*) so it may sometimes fall out, beside the ordinary course of nature, that several *Waters* may be accumulated in *membranes* proper to themselves, or else in the reduplications of the *Chorion*.

As for the *Membranes* or *Coats* of the *Womb*, since their proper use and office chiefly is, to contain the *Waters*; and those *Waters* appear to be two only; it is most certain that the membranes themselves are not (necessary and usually) more than two.

But as for those who reckon three, I conceive they were deluded, because the Ancients call the self-same *membrane* sometimes *Chorion*, from the conflux of *Veines*; and sometimes *Allantoïdes*, from its figure.

Every conception is covered over with these two membranes; as also every *Braine* hath a double *Meninx*: every *Tree* and *Shrub* a two-fold *Bark*; every *Seed* and *Fruit* a two-fold *Covering*: whereof the *Exteriour* is the harder, and tighter.

The more *Interiour* of the two fore-mentioned *membranes* (containing the *Colliquamentum*, or purer *humour*) is the thinnest, and is called *Amnion*, that is, *Amiculum*, the little covering, because it covereth and involveth the *fetus*. The *Exteriour* (which is by much the larger, and stronger membrane) is called *Chorion*, because (saith *Fabricius*) many *Veins*, and *Arteries* are assembled in it, tanquam in *Choro*, as in a *Quire*. And hence the *Coat* of the *Eye*, and likewise that texture of *Veins* and *Arteries* which is found in the *Ventricles* of the *Brain*, are both called *xopondit*, from the resemblance they have with these *veines* in the *Chorion*.

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This Membrane Chorion doth fill all the Womb; containing a stiffe, troubled humour; and to its exteriour part, the Vterine Cake or Caruncles adhering, do fasten the Conception to the Womb.

The Interiour part of this Membrane (in a Woman) is almost conjoined to the Amnion, nor is it easily separated from it. In those Animals which cleave the hoose it is exceeding large, and containeth a hundred-fold more moisture in it, then the Amnion. For the Amnion at the beginning, is scarce so large as a Nutmeg, or fair Bean, and is commonly found in one Horn of the womb onely, namely in that where the Fetus inhabiteth.

The Coat Chorion is (chiefly in Women) rough, and viscous without; but within smooth, and glibbe, and interwoven with abundance of Veins. The upper part of it is (in Women) thicker, and softer, but the lower part, thinner and more membranous.

In women the After-burden groweth to the upper part of this membrane: But in Sheep, several Caruncles are fastened to several parts of it. In Hinds, and Does, the conception doth cling to the Vterus at five places onely: but in a Mare it doth adhere to the Vterus in an infinite company of places. And therefore Fabricius saith, that the After-birth is in almost all Viviparous creatures, a soft flesh, lax, porous, thick, and something black, growing about the terminations of the Vmbilical vessels, which he resembleth to a looser Parenchyma or affusion of a Liver or Spleen; which is therefore by Galen called Caro adenosa, a glandulous flesh; and we now commonly call it Hepar Vterinum, the Uterine Liver; into which the extremities of the Vmbilical vessels are disseminated, which

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which do derive *nutriment* from the *womb* to the *fetus*.

But now, this *fleshy Substance* neither is in all Animals, nor at all times in those in whom it is : but in those Animals onely in whom the *conception* doth firmly cleave to the *womb*, and then onely, when it is fastened to the *womb* to bring down sustenance to the *fetus*. For in the *beginning*, the *conception* (like an *egge* seated in the *womb*) is contiguous to all the circum-jacent parts of the *Uterus*, but doth on no side grow thereunto ; but doth produce its *fetus* (as it is in an *Egge* which is sat upon by the *Henne*) out of the *Humours* contained in it : but that *adhesion* and cleaving to the *womb*, is then first of all procured, and also this *fleshy body* is then first beginning to be generated (which *fleshy substance* is the Tye of the *Conception* to the *womb*) when the *fetus* is now perfectly formed, and standing in need of other, and more plentiful supply of Aliment, doth dispatch the *Extremities* of the *Umbilical vessels* to the *Uterus*, as *Emissaries* or *Agents*, that may from thence (as the *Roots* to *Plants*) convey provisions. For in the *beginning*, (as we have shewed) when the *Punctum saliens*, and the *Blood* do onely appear, the *Propagations* of the *Umbilical vessels* are onely disseminated through the *Colliquamentum*, and the *Coat Amnion*. But when once the *fabrick* of the *Body* is set up, those *Propagations* do conduct themselves farther, and being grown more numerous, are *divaricated* in the *Chorion* also, that so they may transport sustenance from thence to the *fetus*, out of the *whitish humour* which resideth there.

By which it appeareth, that the *fetus* of *Viviparous Animals* is at the *beginning* fed in the same manner,

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manner, as the Chicken is sustained in the *egge*; and doth for that cause abide in the *Vterus*, that at length (when it hath no longer a supply from its own stock) it may, by the mediation of the *caruncles* grow to the *Vterus*; and be more plentifully supported, by the contribution of its *Parent*.

Wherefore *Fabricius* did rightly observe, that the *conception* was in some Animals scarce fastened to the *Vterus* at all. And therefore *Sowes*, and *Mares*, have none of this *carnous* connexion; but their *egge* or *conception*, as it is first of all constituted out of the *moisture* or *juices* which do flow in the *Vterus*, (as the *Egge* in the *Hen* is enlarged by the *White*, without any tye to the *Vterus*) so doth it also receive *Augmentation*; and the *fetus* also, having *Aliment* administred to him from the *conception*, (wherein he is contained) is in the same manner supported, as the *egge* out of the *liquors*. Whence a notable argument doth result, that the *Fetus* of those *Animals* is no more nourished by the *Mothers blood*, then the *Chicken* in the *egge*: and that the *Humour* comprehended in the *Chorion*, is neither *Urine*, nor any other *Excrement*, but the *Aliment* of the *Fetus*. Although (as we have observed before) when the *alible juice* is exhausted, the *remainder* thereof doth degenerate into an *Excrement*, like to the *Urine*. And this also is evident, from that which we have formerly noted, concerning the *Cotyledones*; namely, that the *fleshy substance* is in those Animals of a *spongy substance*, and doth (like a *Honycomb*) consist of innumerable *acetabula*, *holes* or *orifices*, which are all of them full of a *mucons white matter*; (which *Galen* also records to be anciently observed) and that thence the *Extremities* of the

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the *Vmbilical vessels* do suck Nutriment, which
they transport to the *fetus*; as the small *branches*
of the *Mesenterical veines* do, in those Animals
which are already born, derive *chyle* out of the
coats of the Guts, through which they are diffu-
sed.

I therefore apprehend the employment of
the *Vterine cake* and the *caruncles*, to be such
as is commonly imputed to the *Liver* and the
Breasts. For the *Liver* doth adde a preparation to
the *chyle* which is attracted from the Guts, fitting
the same for the sustenance of the Body; and
likewise the *Vterine cake* doth afresh concoct the
alible nutriment which proceedeth from the Pa-
rent, to support the *fetus*. The *Breasts* also (being
composed of a *glandulous substance*) do strut with
milk; and though they are parts which (in some
Animals) do not appear at all, yet at the time of
pregnation they are seen to be full, and tumorous:
so the *Vterine cake*, being a *laxe* or *flaggy* and
fungous substance, doth flow with a whitish sap,
and is never found but at the time of *Ingravidation*.
The *Liver*, I say, is the nutritive instrument
of the Body wherein it is; the *Breasts* of the In-
fant, and the *Placenta* of the *Embryo*. And as the
mother doth by her own food acquire more *milke*
then she hath use for to sustain her *flesh*, and *blood*,
which *milk* is reconcocted in her *breasts*, and trea-
sured up; so also such Females as are great with
young (in whose *womb* this *Placenta* is) do pre-
pare, and suppeditate to their *fetus* an aliment
which is defecated by those *caruncles*: by which
it cometh to pass, that an impure or laudible diet
is administred to the *Embryo's*, according as the
Parents diet it self is either wholesome or impure,
and according to the sufficient or imperfect con-
coction,

coction, which they afford it in those organs of the Uterus. For some Embryos have a more perfect organ provided for them, such as is that *carnous substance* of the Uterus, which is wanting in some. In some likewise this *Vterine cake* is thicker, larger, and fuller of Blood; but in others it is more spongy and paler: like those two *Sweet-breads*, or *glandulous bodies* called *Thymus*, and *Pancreas*. For you shall finde as much difference of these in Animals, as of the *Breasts*, or of the *Bowels*: for to instance onely in *Livers*, they are in some ruddy and sanguine; in others, (as in the greatest part of *Fishes*, and likewise *Cachectical persons*) pale. *Mares* do feed upon the crude grafs, and do not chew the cud; *Sowes* swallow themselves with any filth, and both these want a *Vterine cake*, which is the organ of compleating the Aliment.

- And therefore true is that of *Fabricius*; saying, cap. 3. This fleshy substance is, in several kinds of Animals, different in Magnitude, Figure, Scite, and Number. Women have one onely; as *Mice*, *Conies*, *Ginny-pigs*, *Bitches*, *Cats*, and several Animals, whose feet are distinguished into toes, and have teeth in both jaws: but all Animals which cleave the hoof, and have teeth in one jaw onely, whether they be domesticks, as the *Sheep*, the *Cow*, and the *Goat*; or wilde, as the *Hinde*, the *Doe*, the *Roe*, and the like, have diverse. Again, those Animals which have but one, in them it either resembleth a *Cake* (and thence cometh its denomination) as in *Women*, *Conies*, the *Hare*, and the *Mole*, *Mice*, and *Ginney-pigs*: or else it resembleth a zone or girdle, or swath ingirting the trunck of the body, as in *Bitches*, *Cats*, *Ferrets*, and the like. In some it is like a *chalice*, or *Acorn cup*, comprehending the greater part of the fetus (as in the *Hare* and the *Cony* :) where the convexe
part

part groweth to the *Uterus*, and the concavous respects the *fetus*. Likewise in those females which have but one, and that resembling a Cake, though the figure be alike in them all, yet the scituation is unlike. For in a woman it groweth to the bottom of the womb, and is distant a great way, that is by the length of long vessels from the *fetus*: but in Mice, Ginny-pigs, and Conies, it is annexed partly to the Region of the *Loynes*, partly to the sides of the breast. But those animals which have more of these carnous substances then one, they are all of them furnished with teeth in one jaw onely, as Sheep, Cowes, Hinds, Roe-deer, and the like, and yet in these also there is a diversity. For Ewes have more caruncles, and those of different magnitude; the biggest whereof are as large as a Nutmeg; the least, as a Cich-pease, or Vetch: which are also of a round figure, and ruddy complexion, and their convex parts do respect the *Uterus*, appearing like soft Warts, or Nipples. But Cowes have greater, flatter, and paler, which are of a spongy consistence, like Mush-rooms: and these seem to take their original from the *Chorion*. Hinds and Does have five onely; and those bred out of the womb, do protuberate towards the conception, and there exhibit their Cavities. But being firmly fastened to the *Uterus*, are not easily separated from it; except it be when the birth is drawing nigh; at which time (like ripe fruits) they do very easily forego their former connexion. And being torn off from the womb, I have observed the greater part of the Blood which flowes afterward, to issue, not from the Conception, but from the *Uterus* it self.

Fabricius treating of the Union of this Carnous substance with the *Uterus*, doth labour by many (but weak) arguments to prove, that the *Umbilical* vessels,

vessels, do join to the extremities of the vessels *De form.*
of the Womb by several insertions : and *set.*
this he doth undertake, chiefly, to countenance *pag. 122.*
the old opinion received almost by all : for he
confesseth that he can deliver nothing certaine
touching this matter, because the Carnous substance
hinders a man from discovering the truth thereof. But
yet neither sense, nor reason do evince, that there
are any more *Anastomoses* in the *Vterus*, then in
the *Liver*, between the branches of the Gate, and
Hollow-vein ; or in the *Breasts*, between the veins
which convey blood, and those that waft the Milk.
There is indeed, in some places a kind of *contigui-*
ty or juxtaposition of those vessels, and sometimes
an insertion of the one into the Coat of the other ;
but nowhere any such coalition, or *Vnion*, as *Fa-*
abricius conceiteth. For were it so, the veins
ought to be inserted into the Arteries : for the
vessels, which do convey blood into the *Vterus* and
Caruncles are Arteries : but they which transport
it from the *Vterus* to the *Fetus*, are Veins, as is ap-
parent to all men ; because they waft the blood
from the *After-birth* into the Hollow-vein.

Wherefore the Opinion of *Arantius* seems to me
to be more true; namely that the Orifices of the *Um-*
bilical vessels are not united to the Orifices of the
Vessels of the womb. For there are fewer Vessels
conducting blood to the womb, then veins re-
turning it to the *fetus* : and the greatest part of
the propagations of these are terminated in the
Chorion. And yet *Fabricius*, either overswayed
by his respects to *Antiquity*, or his envy to *Aran-*
tius, doth stubbornly persist in the patronage of the
old opinion.

As concerning the *Cotyledones*, or *Acetabula*, *cap. 4.*

M m

Fa- De *Acetas*
bulis.

Fabricius concludeth nothing certain: but only compileth the several opinions of *Antiquity*. But we have before, in the History of *Hinds* and *Does*, shewed in what Animals these *Acetabula* are; where we have withal signified, that they are certain litle Cells of small capacity, dispersed through the *Caruncles* or fleshy substance, and fraught with a white, or gellyish substance: as the *Honey-comb* is full of *Honey*.

In *Hinds*, they do fitly resemble the shape of that cavity in the *Haunch-bone* which receiveth the *Bone* of the *Thigh*; and therefore they are by the Greeks called *Cotyledones*: and in Latine, *Acetabula*; because they resemble those litle Vessels or Sawfers, which were anciently brought to the table with Vineger for sawce. These cavities do not exceed in magnitude the perforations of a large sponge, and into each of them, so many slender sprigs of the *Umbilical* Vessels do deeply insinuate themselves; because in them is laid up the sustenance of the *fetus*, and not blood (as *Fabricius* conceived) but a gelly resembling the thicker white of an egge. Whereby it appears (as we have formerly declared) that the *fetus* of such as cleave the hoof (as likewise all other) are not sustained by the mothers blood.

Hist. an.
l. 7. c. 8.

That which *Aristotle* delivereth concerning the *Acetabula*, that they are diminished as the *Fœtus* doth improve: is contrary to experience; for the larger the *fetus*, the larger the *caruncles* also, and their *Acetabula*, or cavities, are more capacious, and more numerous, and more full of an *albugineous* juice.

If you compress these *caruncles*, no blood at all doth issue out; but as water, or honey doth di-

distill out of a squeezed Sponge, or Honey-comb. So in like manner if you press the *Acetabula*, an albugineous liquor doth drop out; and when that liquor is pressed out, the *Acetabula* are more contract, pale, and flaggy: and at last do resemble the Nipples of the Breasts, or large falling Warts.

Aristotle indeed doth truly affirm, that these *Acetabula* are not in all Animals; for they are not in Women, nor in any else (as far as I know) who have onely one carnous substance in their *Vterus*. But as for their office and use: I conceive that all the Caruncles (like Breasts) do not contain blood, but digest a sap, like to the White of an Egge, which they do administer to nourish the fetus.

The description of the *Vmbilical* Vessels, is elegantly delivered by *Fabricius*, as his Tables or Pictures of them are very artificial. Of the Navel. cap. 2.

The Veins, saith he, passing from the Uterus towards the Fœtus, are ever united, and improved: nor doth their conjunction give over, until two large Trunks do result out of them all; which penetrating the Navel of the Infant, they do constitute one onely large Trunk; which is inserted into the Liver of the Infant, and perforated into the Hollow and Gate-vein. In like manner, the Arteries adjoined to these Veins, which are very numerous, and small, passing on from the Womb to the Fœtus, and at last uniting their forces together, and so enlarging, do conspire into two large Trunks also; which after they have passed the Navel, do separate themselves and break company from the Veins, and sticking to the sides of the Bladder of Urine, by the help of an intervening Membrane; they do bere and there disperse them-

selves into the branches of the great Artery descending into the Thighs. But we must take notice that this description given by *Fabricius*, doth agree only to the *Navel* of an *Infant*, and is not common to the *fetus* of every *Animal* at large: Nor yet to an *Infant* neither, but after it is fully formed; for the *Arteries* (at the *beginning*,) are inconspicuous, as being so slender, that we have need of the quick sight of a *Lynceus* to discern them: nor do they indeed reveal themselves afterwards, but only by their *pulsation*: for in other things they are no way distinguishable from *Veins*. Because therefore (as I have shewed elsewhere) the slender branches or filaments of the *Arteries* have no *pulsation*, (at least so far as we can discover) they cannot be known from *Veins*: for they are at that time so thin & subtle, that they are woven to the coats of the *veins* like the *finest threads*: or rather do obscurely insinuate themselves into the *tunics* of the *veins*: whereby they are utterly indiscernable. But all the *veins* (by a retrograde production) uniting their sprigs at last, do all conspire into one *Trunk*, (as all the branches into one stock) as also the *Mesenterick Veins* are all concluded in the *Vena Porta*.

Neer the *Embryo*, they are divided into two *Trunks*; but when once they enter into him, they do constitute one onely *Navel*, which doth terminate in the *Hollow-vein*, neer the right *deaf-ear* of the *Heart*; & passing through the *Liver*, is inserted into the *Gate-vein*, and doth scatter no more *Propagations*, untill by a very large *Orifice* it displayeth it self out of the *gibbous part* of the *liver*. So that if you open the *Trunk* of the *Hollow-vein* from the *deaf-ear* of the *Heart*, downwards, and so exhaust it of all its *blood*, you may perceive *three Orifices* as

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conjoined together; one whereof is the entrance into the descending Trunk of the *Hollow vein*, the other is the going out of the *Branch* of the *Liver* disseminated through all its *gibbous part*; but the third is the *Original* of this *Umbilical vein*. Whereby it clearly appeareth, that the *original* of the *veins* is not to be sought for in the *Liver*: because the *Orifice* of the descending *Trunk* of the *Hollow-vein* is much larger then the *Liver-branch*; for the *Umbilical branch* is as large as that. But the *Branches* are never said to be the *Original* of their *Trunk*, but rather where the *Trunk* is largest, there are we to repute the *Original* of the *branches* to reside: now that happeneth at the *entrance* of the right *ventricle* of the *Heart*; and therefore that *ventricle* is to be accounted the *original*, & *promptuary* of all the *veins*.

I return now to the *Umbilical vessels*, which are not divided after the same maner in all Animals; for there are found in some 2. or more litle *Branches* in the body of the *fetus*; whereof some pass into the *Liver*, others into the *Vena Portæ*, or *Mesenterical veins*. But in a *human fetus*, the *Trunks* of the *veins* & *arteries* being involved together, are complicated, some 3. or 4. *Fingers breadth* from the *Navel* (as if one should twist so many wax candles together like a *cord*) being skinned over, and conglutinated by the help of a thick & gellyish *membrane*. This litle *cord* passing on to the *Chorion*, is in the flat part of the *After-birth*, and *interior superficies* of the *Chorion* distributed into several *Propagations*; and thence is ramified into many other almost infinite litle *Branches*; by which the *Aliment* attracted as it were by so many roots, is derived to the *fetus*. The *Veines* relating to this litle *Cord*, are distinguished in sundry places by

little knobbs, or warts, as it were by little bladders full of blood, that so the blood might not rush in too forcibly upon the *fetus*. By the number of these protuberations, the superstitious *Midwives* do spend their divination concerning the number of *children* yet to come; and in case they finde none of these knobbs, they pronounce the Woman *barren* for the future; and likewise by the distance betweene these protuberations, they fondly prophesie of the space between *childe* and *childe*; and also of the discrimination of the Sex, from the variety of their complexion.

Also the constitution of the *Umbilical vessels* is like to this, in almost all other *fatuses* which have but one onely *Uterine cake*; namely, in *Bitches*, *Mice*, and others: but the little cord is in them shorter, and less complicated. But in *Cows*, *Ewes*, *Hindes*, *Does*, *Sowes*, and other Animals, whose *fatus* is not sustained by aliment derived from one *carnous substance*, or *cake*, but from diverse, the distribution of the *Umbilical vessels* is also diverse: For the little branches, or terminations of the vessels are not disseminated through the cake onely, but also (and that chiefly too) without it, through the coat called *Chorion*, dispatching their most slender fibers thither likewise: just as the distribution of the *Umbilical vessels* (namely without the little cord) appeareth in a humane *fatus*, before the conception is fastened to the *Uterus*. Whereby it appeareth, that the *Embryo* doth not derive all his Aliment from the cake; but part thereof, and that the chiefest, from the humor contained in the *Chorion*.

As touching the uses of the *Umbilical vessels*,
I do

I do not consent with *Fabricius* : for he is of opinion that all the *blood* is derived to the *fetus* from the *Vterus* by the *veines* ; and the *vital spirits* from the *mother* by the *Arteries*. He also denyeth, that any part of the *fetus* in the *womb* doth execute any *publick function* : but affirmeth, that each particular part taketh care onely for it selfe, how it may be nourished, augmented, and preserved. And also, because he findeth no *Nerve* amongst the *Umbilical Vessels*, he concludeth the *fetus* to be void of all *Sense* and *Motion* : Implying, that the *Mothers Womb*, or the *Uterine Cake*, is as it were the *Heart*, and *Original* from whence all things spring to the *fetus*, and from whence the *Influent heat* is divided amongst all the parts. All which are manifest mistakes. For the *Humane Embryo*, when he is not yet four moneths standing in the *Womb* (and some sooner) exerciseth an apparent *motion*, *volutation*, and *calcitratio* : especially if he be prejudiced by extremity of *cold* or *heat*, or any other outward inconvenience. Likewise the *Punctum saliens* it self, (before the *Heart* is erected) doth stirre by an apparent *pulsation*, and also distribute blood, and spirits : and being (as we have observed) reduced to a dying and languishing condition by cold, is by the fresh accession of heat, kindled anew, and revived. And also in the *Cesarean birth*, it is very evident, that the *Embryo's* life doth not immediately proceed from the *Parent*, nor the *Spirits* result from her : for we have often seen *Infants*, which have been cut out of their *Mothers Womb*, survive their *Parent* for several hours : and have also known a *Cony* and a *Hare* which did live, though they were born by *incision* made upon the *Vitru* of

their *Parents*. Moreover, it is a sure way to know whether the *Infant* that sticketh in the birth be alive, or not, by the pulsation of the *Vmbilical Arteries*. But most certain it is, that those *Arteries* are not moved by the virtue or operation of the *Mothers*, but of his own proper *Heart*: For they keep a distinct time and pawze, from the *Mothers pulse*: which is easily experimented, if you lay one hand upon the *Mothers* wrest, and the other on the *Infants Navel-string*. Nay in a *Cæsarean Section*, when the *Embryo's* have been yet involved in the *membrane* called *Chorion*, I have oftentimes found (even when the *Mother* was extinct, and stiffe almost with cold) the *Vmbilical Arteries* beating, and the *Fætus* himself lusty. Wherefore it is not true, that the *Spirits* do proceed to the *fætus* from the *Mothers Arteries*: nor is that more true; namely, that the *Vmbilical Vessels* of the *fætus* are conjoined by *Anastomosis*, to the *Vessels* of the *Vterus*. For the *Fætus* enjoyeth his own proper life, and is furnished with beating *Arteries*, which are full of *Blood*, and *Spirits* long before the *conception* (in which he is formed, and walloweth) doth cleave to the *Vterus*: just as it is with *Chicken* in the *Egge*.

As for the use of the *Arteries* in the *fætus* (as also in grown bodies) we have in our *Treatise* of the *Circulation* of the blood, demonstrated it to be much different from what hath been formerly received: all which is also confirmed from hence.

The *Secundines*; they also are an undeniable part of the *Conception*, and do depend upon the *Fætus*, assuming life and their vegetal faculty from him. For as in the *Mesentery*, the blood
is

is derived to the Guts, by the branches of the Cœliacal, and Mesenterical Arteries; and that very Blood being circulated by the Veines, doth convey the *chyle* together with it unto the *Liver*, and the *Heart*: so in like manner, the *Umbilical* Arteries do derive blood to the *Secundines*, which blood the Veins do reduce to the *Fetus*, together with *alible juice*. And therefore those Arteries do not immediately proceed from the *Heart* as principal Vessels; but (as instruments of inferior rank and quality) do arise out of the Crural branches.

There came forth a Book of late, wrote by *Adrianus Spigelius*, entituled *De formato Fœtu*, of the formed *fœtus*; wherein he treateth concerning the Use of the Umbilical Arteries; and doth demonstrate by powerful arguments, that the *Fœtus* doth not receive its Vital Spirits by the Arteries from the *Mother*: and hath fully answered those arguments which are alledged to the contrary. But he might also as well have proved by the same Arguments, that the Blood neither is transported into the *fœtus* from the *Mother's* Veines by the Propagations of the Umbilical Veins: which is chiefly made manifest, by the examples drawn from the *Hen-egge*, and the *Cæsarean Birth*.

For did the Heat and Life flow to the blood from the *Mother*; she being extinct, the *Infant* would instantly dye also; (for he must needs be a thing concluded in the same fatality) nay before her: for when death approacheth, the subordinate parts doe first languish, and grow cold, before the principal; and hereupon the *Heart* declines the last of all. The Blood, I say

say, of the *Fetus* himselfe, should grow chill first, and disproportionate to its Office, as being derived from the *Uterus*; seeing that the *Uterus* itself, is deprived and destitute of all vital heat, before the Heart.

Of

Of the Conception.

F*Abricius* hath indeed recounted many miraculous things, concerning the *Birth*, but we meet with more things worthy our wonder concerning the *Conception*. It is indeed a dark, obscure business; however we shall adventure to propose something in a *problematical* way, in such sort that it shall appeare we doe not onely goe about to subvert other mens opinions, but also to disclose our owne. And yet whatsoever falleth from me concerning this subject, I desire may not be so taken, as if I conceived them pronounced by an *Oracle*; but that liberty which I freely allow all other men, I doe of right challenge to my self; that so I may offer those things as true, which seem probable in such dark matters, until such time as they can be convinced of falsity or errour.

This imployment doth chiefly relate to the *Uterus*, without whose *preparations* and *functions*, you may in vaine expect a *Conception*. And because it is certaine, that the *Geniture* of the *Male* doth not so much as reach to the *cavity* of the *Uterus*, much less abide there for any time; that *geniture* doth derive *fecundity* to the *Uterus* only by a kinde of *contagion*, (not as if it were now *tangent*, and *operating*, but because it hath formerly *touched*.) The *Woman* or *Female* doth seem after the *spermatical*, *contact* (in *coition*) to be affected in the same manner, and to be rendered *prolific*, by no *sensible corporeal Agent*, as the *Iron* touch-

ouched by the *Loadstone*, is presently indowed with the virtue of the *Loadstone*, and doth draw other iron-bodies unto it. Namely, having once received that virtue, which we have spoken of, it doth exercise the *plastick generative power*, and *procreateth* its own like, no otherwise then *plants* doe, which we see are impowered with the force of both *Sexes*.

But I cannot but wonder, where that *faculty*, (when the act of *coition* is finished, before the production of the *Egge* or *Conception* doth reside? and to what that *active vertue* of the *Male* is imparted? namely, whether to the *Uterus* alone, or to the whole *Female*? or rather, primarily to the *Uterus*, but secundarily to the *Female*? or lastly, whether, as we see with our *eyes*, and think with our *braines*, so a *female* doth conceive with her *Uterus*?

For though the *female* sometimes (conceiving after *coition*) doth not produce a *Fetus*: yet we know that those *Symptomes* did ensue, which gave a cleare testimony of a *conception* set on foot, (though it came to nothing.) Your litle *Bitches* which are kept too plentifully, and thereupon admit *coition* (without success) are notwithstanding observed to be sluggish about the just time whereat they ought to *puppy*, and bark as if they were in *distress*, and likewise filch away the young *whelp* from another *Bitch*, and lick them over and cherish them, (as tenderly as if they were their own natural productions) and fight eagerly to keep them from the true *Parent*. Nay some of them have *milk*, or *beestings* (as they call it) in their *teats*; and are obnoxious to the distempers incident to those that have really *pup-*
pied

pie'd; just as *Hennes* will cluck in their season, though they have no eggs at all to sit upon. Some kinde of *Lirds* (as namely *Pigeons*) if they admit coition at the wonted time, though they lay no eggs at all, or *subventaneous* ones onely, yet are possessed with their usual sedulity & providence of building nests.

For the vertue proceeding from the *Male*, doth so largely fructifie the whole *Female*, that it produceth a thorough change and alteration, as well in the frame of their *minds*, as in the constitution of their *bodies*. And though this doe principally happen to the *Vterus* fitted for the impression; and from thence the power and efficacy thereof be derived to the whole *body*; (as from the turgent *testicles* of the *Male*, there is an accession of strength superadded to the whole *body*) yet the same scruple remaines: namely, how this power communicated to the *Vterus* it selfe, doth inhere in it? as whether in the whole *Vterus*, or in any one part of it onely? For there is nothing to be found abiding therein after coition: for the *geniture* of the *Male* doth either suddenly fall out againe, or vanish away, and the blood doth circulate againe from the *uterus*, by the *veffels*.

Besides, what preparation or maturity of the *Vterus* is it, that doth require the *genital seed*; or from whence doth it proceed? for unless the *uterus* be prepared for coition, all other attempts are frustrate; nay several *animals* doe not admit coition it self, without they be thus prepared. That maturity, I confess, doth sooner befall them, by reason of their converse with the *Male*, and the incitements which he useth to provoke them; yet it

Of the Conception:

it is procured (as that ripeness of fruits in plants) by natures owne inclination and tendency. But what this *Alteration* is, I shall now deliver, according as I have found it by experience.

First of all the *uterus* appears *thicker* and more *fleshy*: and afterwards (forasmuch as concerneth the *interiour superficies*, which is the place where the future *conception* is to be received) it groweth more *tender*, answering in *lubricity* and *softness* to the internal ventricles of the *Braine*, as we have even now affirmed concerning *Hindes*, and other creatures which *cleave the hoofe*. But in *Bitches*, *Cats*, and other multiparous Animals, whose feet are distinguished into *toes*, the *hornes* of the *Wombe* doe exactly resemble the litle smooth trumpets of a womans *womb*, or the *appendixes* of the guts of *Birds*, or the *Ureters* in *Men*: and in some places have litle *knobs* which doe *swell inward*, and become exceeding soft; through which, after *coition* (as we have observed in *Hinds* and *Does*) as if they did open themselves, the first albugineous humours doe transpire into the capacity of the *Uterus*, out of which humours the *Conception* or *Egge* is formed. And this is the manner how the *Uterus* is by the *Coition* of the *Male* (like *Fruit* by the *Summer heat*) *impregnated*, and heightened into the highest pitch of maturity.

But because there are no manifest signs of *Conception* visible, before the *Uterus* doth begin to open, and the albugineous liquor, or slender threads, (like the *Spiders web*) and the first *rudiments* of the future *Egge* or *Conception* appear: and seeing the substance of the *Uterus*, now ready
for

for *Conception*, doth so neerly resemble the Constitution of the Braine : why may we not imagine, that both their functions are also alike ; and that something like, if not the selfe same thing that the *phantasme*, or *appetite* is to the *brain*, is excited in the *Uterus* : from which the generation or procreation of the *Egge* doth succeed ? for both their functions are equally called *conceptions*, and both are *Immaterial* ; though they be the *principles* of all the *actions* of the *body* : namely this, of the Natural, that of the Animal actions : this the first cause and principle of all actions relating to the generation of *Animals*, & that of all actions tending to their preservation. And as *Appetite* doth spring from the *conception* of the *braine*, and that *conception* from the outward *appetible* or *desirable objects* : So also from the *Male* (as being the more perfect *Animal*) as from the most natural appetible object, the natural conception doth arise in the *Uterus*, as the Animal conception in the *Brain*.

And from this *Appetite* or *Conception* it cometh to pass, that the female doth produce an offspring like the male Genitor. For as we, from the *Conception* of the *Form*, or *Idea*, in the *Braine*, do fashion a form like to it in our works, so doth the *Idea* or *Species* of the Genitor, residing in the *Uterus*, by the help of the formative faculty, beget a *Fetus* like the Genitor himself ; namely by implanting that *Immaterial species* which it hath, upon its *Workmanship*. In like manner as *Art*, which is the *idea*, or *Species* of the future work, doth produce a *Like* in its operation, and generate it in the *matter* : As the *Builder* erects a *House*, according to his pre-received *conception*. And the same thing happeneth in other productions

ctions, and artificial generations. So that what discipline doth effect in the *Braine*, namely Art; that in proportion doth the Coition of the Male effect in the *Uterus*, namely the *plastical Art*: whereby several *fatufes* are procreated either like or unlike, by the same Coition. For if the Generations, and first artificial conceptions (which are onely imitations of the natural) are thus produced by the *Braine*; how much more probable is it, that the Exemplars of Animal Generation and conception, are in like manner produced by the *Uterus*.

And because Nature (all whose works are admirable and divine) doth institute such an Organ (namely the *Braine*) by whose sensitive faculty and virtue, the conceptions of the rational soule doe exist; namely Desires, and Arts, and the Principles and Causes of so many several productions, whereof man (by the motive faculty of the *Braine*) is the Author by Imitation; why shall we not think, that the same Nature, which hath contrived the Womb, which is a no lesse admirable Organ then the *Braine*, and hath framed it of a like constitution to execute the office of Conception, hath designed it also to a like function, or at least to one which beareth an Analogy with it: and that Nature did intend an Organ which is every way like the *Braine*, to an imployment, like to that to which the *Braine* is assigned? For since a skilful Artificer, doth accomplish his Workmanship, by his ingenious proportioning one Instrument to one thing, and the same to the same, and the like to the like: So that by the materials and shape of his Instruments, a man may easily judge of their use and action

actions; no less then *Aristotle* hath instructed *Analyt. l. 2.*
 us, to know the nature of *Natural Bodies*, by c. 35.
 their conformation, and the *Fabrick* of their
 Parts; and the *Art* of *Physiognomy*, doth by
 lineaments and parts of the face (as the *Eye*,
Nose, *Fore-head*, &c.) give judgement of the
manners and *dispositions* of *Men*: What shall
 hinder us, out of the same *fabrick* of parts,
 to pass our conjecture that their Office is al-
 so the same?

But such is the preposterous success of things,
 that when we come to debate customary and fa-
 miliar things, their frequency doth diminish their
 greatness, and admiration which is due unto
 them; but when matters of less consequence
 (but such as are more unusual) do present
 themselves, wee instantly magnifie them be-
 cause of their novelty and rarity. Whosoever
 shall weigh with himself, how the *brain*
 of the *Artist*, or the *Artist* himself by virtue
 of his *brain*, doth form things which are not
 present with him, but such as he only hath
 formerly seen, so much to the life: and how
 little *birds* which immure themselves all win-
 ter long, do exactly *chant*, and recall to minde
 those *Ditties*, the next *Spring*, which they had
 learned the *Summer* before, though they did
 never practise them all the while; and which
 is yet more strange, how a little *bird* will
 most artificially contrive a *Nest* (whereof shee
 never saw any *platform* before) and that not
 from her *memory*, or any *habit* implanted
 in her, but onely by meere *phansie*: and
 how a young *Spider*, without any *pattern*,
 or *brain*, by the help of *phansie* onely, doth
 N n dispose

dispose her *web*; whosoever, I say, doth diligently ponder these things, will, I conceive, not think it an absurd or monstrous matter, for a *woman* to become the *efficient cause of Generation*, being *impregnated by the conception of a generall, immaterial Idea*.

I know full well, that some scoffing persons will laugh at these conjectures; approving nothing but their owne private inventions. Yet this is the wont of *Philosophers*, when they cannot clearly discover how things themselves are brought about, to conceive some way consonant to the *course of nature*, and the next borderer upon truth her selfe, how such matters may be atchieved. And, indeed, all those *Opinions* (which we now cry up) were at first meere *figments*, and *imaginations*; untill they wrought a solid credit in us, by sensible experiment, and were ratified by their *necessary knowne causes*. *Aristotle* saith, *That Philosophers are in some sort lovers of Fables, because a Fable doth consist of strange things*. And, indeed, those who were first possessed with the admiration of things, did advance *Philosophy*. And for my owne particular, since I plainly see that nothing at all doth remaine in the *Vierus* after *cognition*, whereunto I might ascribe the *principle of generation*; no more then remains in the *braine* after *sensation*, and *experience*, whereunto the *principle of Art* may be reduced; but finding the *constitution* to be alike in both, I have invented this *Fable*. Let the Learned and ingenious stock of men consider of it; let the supercilious reject it: and for the scoffing
ticklish

Metaph. 1.
1.1.2.

ticklish generation, let them laugh their swinge.

Because, I say, there is no *Sensible thing* to be found in the *Uterus*, after coition; and yet there is a necessity, that something should be there, which may render the *female fruitfull*; and that (in probability) can be no *corporeal essence*; we have no refuge left us, but to fly to meere *Conception*, and reception of *Species* without any matter; namely, to apprehend, that the same thing is effected in the *womb*, as in the *Braine*: unless some cunning *Philosopher*, whom the Gods have better provided for, can finde out some *efficient cause*, which is not concluded in our recapitulation.

Some *Philosophers*, even of our owne time, have furbushed over the old opinion concerning the *Atomes*: and doe therefore conceive, that this *Contagion* (as also all other) doth proceed from the most subtile *effluvijs*, or *emanations* of the *masculine seed*, which do easily transpire after the manner of *Odours*, and so are shot into the *Uterus* at the time of coition. Some againe raise up certaine *incorporeal spirits*, like so many *Agents*, *Angels*, or *Dæmons*. Others understand a *Contagion*, like to a kinde of *ferment*, or *sower leavening*. Others *phantasie*, and imagine otherwise. Allow therefore, amongst others, some place for this conjecture of mine, untill there be some certainty established in the business.

I have observed many things, which will easily extirpate the recited opinions of other men: (so that now it is much more obvious to say what it is not, then what it is) but those *Observations* relate not to this place,

but must be proposed elsewhere. At the present I shall say this onely: If that which we commonly call *Contagion*, as being derived from the *spermatical contact* in coition, and remaining behinde in the *female*, (when the *Geniture* it selfe is not then in presence) is the *efficient* and *operatour* of the *future procreation*: if, I say, this *Contagion* (whether it be *Atomes*, or *Odour*, or *Ferment*, or whatsoever else) be free from the nature of a *body*, it must of necessity be an *incorporeal thing*. And if moreover, upon enquiry it do appear, to be neither a *Spirit*, nor a *Demon*, nor a *Soul*, nor any part of a *Soul*, nor yet something which hath a *Soul* (as I conceive I can demonstrate by several *arguments*, and *experiments*.) What remains, since I can imagine nothing else, nor no man hath hitherto dreamed of any other thing, but freely to profess my self to be at a stand? But

Ibid. He that doubts & admires, saith *Aristotle*, doth confess he doth not know. Wherefore, if to avoid the stain of *Ignorance*, ingenuous Men turn *Philosophers*, it is cleare, that they pursue *Knowledge*, for *Knowledge sake*, and not for any other use.

Wee ought not therefore to be condemned, if being desirous of knowing things, and upon that account walking in untrodden paths, wee set before you something, which, at first blush, may seem *fabulous*, and *fictionis*. For as all things are not to be swallowed with too much credulity; so those things which have been exactly and long considered, are not utterly to be despised, though they do not appeare so rare to sharp-witted men.

Aristotle himself wrote a Book de *Mirabilibus*

bus Auditis, of Heare-say Wonders. And in another place hee saith, *That wee must not onely pay thanks to them, to whose Opinions a man may safely subscribe; but to those also who have spoken but superficially to the purpose. For even they also are of some use, for they exercise our habits. For had not Timotheus been, wee had lost a great deale of Musicke: And yet if Phrynis had not been, Timotheus had not been existent neither. In like manner they who have delivered any kinde of truth; for wee have received some Opinions from some Philosophers, and yet some others were the occasion of these Philosophers.*

And therefore being moved by the example and authority of so Gallant a person as *Aristotle*, least I might seem made up of nothing but the subversion of other mens *Doctrines*; I have chosen rather to propose a feigned Opinion, then none at all: and have contented my self in this place to play the *Phrynis* to *Timotheus*; viz. to shake off the sloth and drowziness of the *Age* wee live in, and to awaken the wits of Industrious heads, permitting rather that abler men should sport themselves with my proposalls, then that any carefull Enquirer into the nature of Things should accuse mee of sluggishness.

Truth is, a man cannot search after a more august *Theorem*, nor learn any thing of more use, then this; namely, How all things are produced by an *Univocal Agent*? or after what manner the same thing doth still generate the same? and that not onely in the productions of *Art*, (for so a *House* erects a *House*, one *Face* limnes another, and one *I-*

Arist. hist.
an. l. 7. c. 6.
Gen. de gen.
an. l. 1. c. 17
l. 7. c. 11.

mage formeth another *Image*) but in those also which relate to the *Minde*: as a *Minde* begets a *Minde*; and one *Opinion* another *Opinion*. Democritus his *Atomes*, and Eudoxus his *Chiefest Good* placed in *Pleasure*, did impregnate Epicurus: Empedocles his *Four Elements*, Aristotle: the *Doctrine* of antient Thebes, Pythagoras and Plato: and *Geometrie*, Euclid. Just in this manner is the *Son* borne like the *Father*; and the *Virtues* which doe innoble a *Family*, and the *Hereditary Vices* also, are sometimes after many *Generations* transported to *Posterity*: some *Diseases* also produce their like in other subjects; as the *Leprosie*, the *Gout*, *Syphilis*, or *French-Pox*, and so forth. But what talke I of *Diseases*, since Succession hath at a vast remove, repeated the very *Moles*, *Warts*, and *Scarres*, which the *Great-grand-fires* formerly wore? The *marke* of the *Familie* (saith *Plinie*) is repeated in the *armes* of the *Daci*, every fourth *Birth*. That *Minde*, *Opinion*, and those very *Manners*, which are now out of *use*, may many yeares hence (when all those are decayed, which are now received) returne againe. For the *Eternall minde* of the *Divine Creatour*; which is imprinted in *Things*, doth create the *Image* of it selfe in *Humane Conceptions*.

Having therefore overcome some difficulties which relate to this Subject, I have a strong desire to discourse the Matter more closely: that what I have hitherto delivered cursorily, may seeme to carry a fairer probability at least with it, and also

also to excite the Wits of Studious men, to make a deeper search into the businessse.

Therefore (that we may illustrate the thing the better) let *A* stand for the *fruitfull egge* (namely the matter of the *fruitfull chicken*) which is *alterable* and *convertible* into a *chicken*, or is a *chicken in posse*: and let *B* stand for that which *fructifieth* the *egge*, distinguishing it from a *subventaneous egge*: namely, the *efficient cause* of the *chicken*, or that which doth alter the *Egge*, and convert or terminate it into a *chicken*. And *C* for the *chicken* it selfe, or *final cause*, for whose sake both the *Egge*, and that which fructifieth the *Egge* doe exist: namely, the *act*, or *reason* of the *chicken*.

Now we take it for granted (which *Aristotle* doth demonstrate) that every *first Mover* or *Alterer* is together with that thing which is *moved* or *altered* by it. Now those things are most properly said to be *simul*, together, which are generated at the same time: so that *movens & mobile* the thing *altering*, and the thing *altered* are actually together, and in case one of them be, the other must needs bee also; for of necessity if the effect be in being, the cause thereof must also be.

Whensoever therefore *A* (namely the *fruitful Egge*, is *actually* in *Being*; *B* likewise (namely the *internal mover*, and *efficient*, or *fructifier*) is *actually* in *being* also. But whensoever *B* is *actually* existent, *C* also, (at least in some sort) namely the *Species* of the *chicken*, or the *form* without matter is existent. For *B* is the *internal efficient* of the *chicken*; that is to say, that thing which doth

move, or alter) *A*, (namely the *Egge*) into *C*, namely the *Reason* of the *chicken*. That therefore every moving thing, may be together with the thing that is moved; and every cause with the thing caused, it is necessary that *C*, should exist together with *B*, because the *Final* cause, as well in *Nature*, as *Art*, is the first of all the causes; for it moveth, and is it selfe not moved: But the efficient moveth, because it is incited by the finall cause. For there is in every efficient, in some sort, *ratio finis*, the reason of the End or finall cause; by which final cause, the efficient, operating with providence, is moved.

de part. ar.
l. 1. c. 1.

Aristotles Authority is clearly on our side. That seemeth, saith he, to be chiefeſt amongst Natural causes, which we signifie under this notion, *Cujus Gratia*, for whose sake: For that is the reason; but the reason is the first cause as well in *Natural*, as *Artificial* effects. For when the *Physitian* doth define *Health*, and the *Mason* a *House*, by either the *Intellect*, or by *Sense*, he useth to render the reasons and causes of the thing which he doth effect, and also subjoineth the reason why hee maketh it so: though that cause which is the cause for whose sake, which is the cause, and reason of the good and faire, is rather conjoined to the works of *Nature*, then of *Art*.

Phys. l. 2.
metaph. 3.

But the *End*, saith he, is the thing for whose sake: as the thing for whose sake we walk, is *Health*. For if you aske, why a man doth walk, we reply, to continue his *Health*: and having made that answer, we conceive we have rendered the cause thereof. And therefore whatsoever is interposed, some other thing moving thereunto, is done for the *Ends* sake: as *Extenuation* is procured

red for Health sake, or Purgation, or Physick, or any other instruments, for all those are for the Ends sake. And a while after. But we ought alwayes to seek out the first cause of every thing: as in other matters. As a man buildeth because he is a Builder: but he is a Builder by reason of his Art of building: this therefore is the first cause: and so it is in all things whatsoever. And hereupon he affirmeth, that, that cause which doth first move, and in which the Reason and *de gen. an.* form doth lye, is a worthier, and more divine cause, *l. 2. c. 1.* then the material.

In every Natural Generation of Animals therefore, both the matter out of which, and the efficient by which (namely *A*, the thing moved, and *B*, the thing moving) are both for the sake of the Animal already begotten, or which is to be begotten: because that which moveth, and is not moved it selfe, namely *C*, is alike in them both. For both they (namely *A*, & *B*,) are both movable, and moved; namely the thing fructifying, which is *B*, (which doth both move and is moved,) and that thing which is fructified, which is *A*, namely the Matter or Egge, which is onely moved or altered. Wherefore if no moveable thing be actually moved, unlesse the thing moving be together present with it. Certainly, neither shall the Matter be moved, nor the Efficient move or effect any thing, unlesse the first mover bee in some sort present too: viz. the form, or species which is without Matter, and is the principal cause. For the Efficient and Generant (according to *Aristotle*) as they are such, do belong *l. 2. c. 4.* to that which is effected, and generated. And there-

therefore it is a syllogisme framed out of the first and necessary causes : namely,

Whensoever B is actually existent , C also is actually existent: (namely, moving in some sort)

Whensoever A is actually existent , B is also actually existent.

Therefore , whensoever A is actually existent, C also is actually existent.

*Arist. de
part. an. l.
I. c. 5.*

Indeed *Natural* , and *Artificial Generation* are after one and the same manner. For both are instituted for the sake of something, and doe alike out of a kinde of providence direct themselves to a proposed *End*: for both are first moved by some conceived form, which is immaterial, and is produced by *Conception*. For the Braine is the Organ of the *Conception* of the one, (for Art is the Reason of the Worke) (devoyd of all *Matter*) in the Soule, whose Organ the Braine is) but the *Uterus* , or *Egge* of the Other.

The *Conception* therefore of the *Egge* , or *Uterus* , is (in some sort) like the *Conception* of the Braine it selfe , and both
of

of them doe alike partake of the *End*. For the Species, or Forme of the Chicken is in the *Uterus*, or *Egge*, without any matter at all: as the reason of the Work is in the Artificer, and the Reason of the House, in the Brain of the Builder.

But because, *to inesse*, this word, to bee in, is perhaps an Equivocal word, and things may bee said to bee *Simul*, together, severall wayes; therefore we say, and affirme, that the Species and Immateriall Forme of the future *Chicken* is *Aliquo modo*, in some sort, the cause of the pregnation, and fecundity of the *Uterus*: because, after coition, there is no corporeal thing found therein.

But how this Immateriall cause, as the principle, can be alike in the Braine, and in the *Uterus*, and how they agree among themselves, or doe differ, namely the Conceptions of the Braine, and of the *Uterus*, or *Art*, and *Nature*; and in what manner, that which fructifieth (namely, the *internal Efficient cause* of the procreation of an *Animall*) is in the Male, and its Geniture; in the Female and her Wombe; in the *Egge* also, or mixt Workmanship of both; and what the difference betweene them is: hereafter, when wee shall treat Universally of the Generation of all *Animals* (even of those also, which are generated by *Metamorphosis*; namely, of *Insects*, and *Spontaneous Productions*, in whose *Egges*, or first *Rudiments*, there is a plaine Species or Immateriall forme, as being the moving principle in regard of those things which are to be pro-

produced, as also in all other Seed whatsoever) and also when we shall discourse of the Soule, and its affections; and also how Arts, Memory, and Experience, are onely the Conceptions of the Brain, wee shall endeavour both largely, and perspicuously to explaine.

FINIS.



ERRATA.

P^Ag. 42. lin. 36. read *arising from the Chine*. p. 46. l. 30. r. *doth*, but by *Juxtaposition*. p. 67, l. 11. carried it to. p. 69. l. 20. every other. p. 70. l. 27. *clocking*. p. 93. l. 23. *its growth*. p. 105. l. 11. *is yet*. p. 291. l. 13. *cone*. p. 292. l. 5. *for are not*, r. *would not be*. *ibid.* l. 12. after *part*, r. *made up of those humours mixt together; it is a similar animate part*. *ibid.* l. 14. *del. and*. p. 293. l. 16. *del. it*. p. 294. l. 25. *for pour out the Serum*, r. *pour it out*.



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